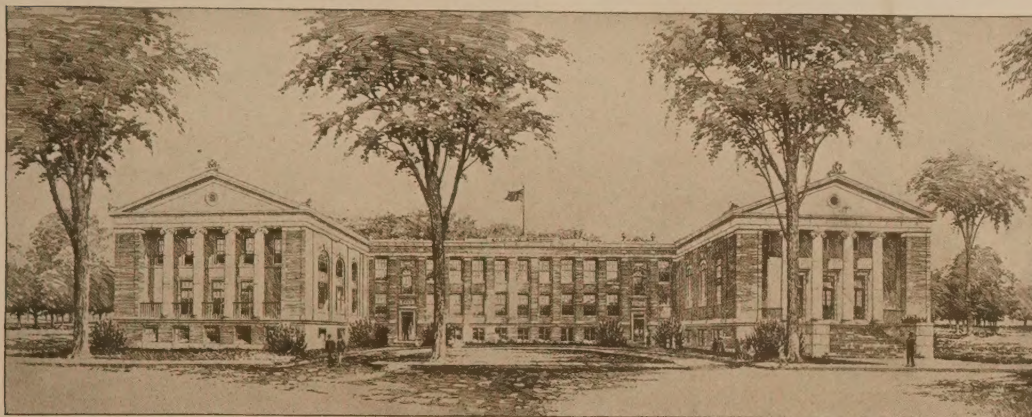


General Principles of School Planning and Construction

Tooker and Marsh, Architects



High School, Norwich, N. Y. Tooker & Marsh, Architects. Arthur W. Coote, Associate.

IT was formerly the custom in planning a school-building to combine a number of standardized units, sufficient only for the immediate needs of the community. In recent years the tendency has been toward a broader aspect, involving a comprehensive building programme. The subject is one which, through its interesting development, has enlisted the services of many of the best architects, who are striving genuinely toward the best solution of each problem rather than interesting themselves solely for the financial advantages to be gained by merely complying with the conventional requirements, without thought to future development.

Fortunately, the development of school planning has advanced rapidly of late years. There are certain features which have proved to be right and are standard. The days of the dark, unsanitary, ill-smelling schoolroom are, happily, in the past. The end of the present era of progress is not in sight. Architects all over the country are striving to improve present standards, and ARCHITECTURE intends to aid in the interchange of ideas by publishing, from time to time, special issues devoted to this subject. There is no greater need to-day than correct information on the matter of school planning and construction.

This article will deal with fundamentals only, and will, no doubt, be an old story many times repeated to architects who have had experience along this line, but there are many who are undertaking now, for the first time, or will shortly undertake their first school commission, and particularly for them are these few words written.

An architect who receives a commission from a municipality to design a school-building should not be content merely with the requirements given to him, but should consider it his duty, before proceeding, to make a thorough in-

vestigation of the following questions, providing such an investigation has not already been made:

- (a) The percentage of growth of the school population over a period of from five to ten years.
- (b) The geographical location of the probable growth of the community.

With this knowledge he is more properly versed in the requirements of the community and better able to meet its needs.

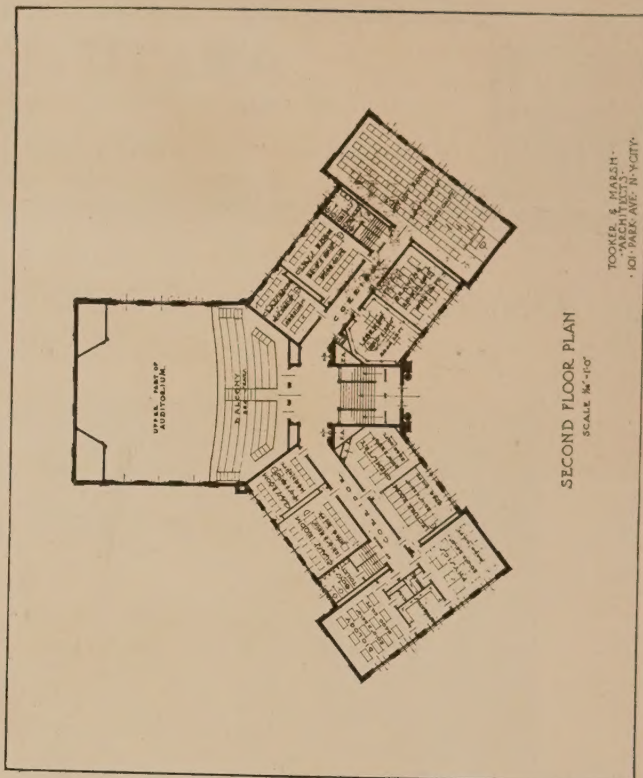
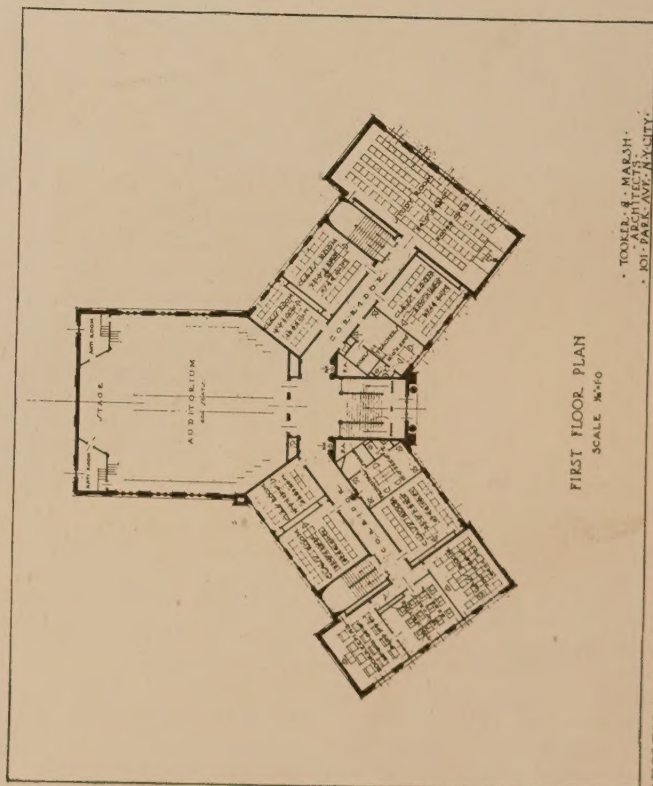
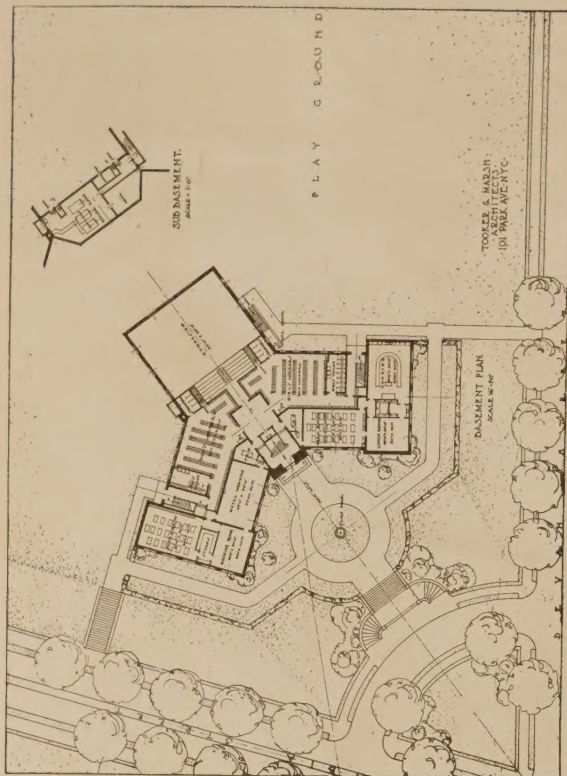
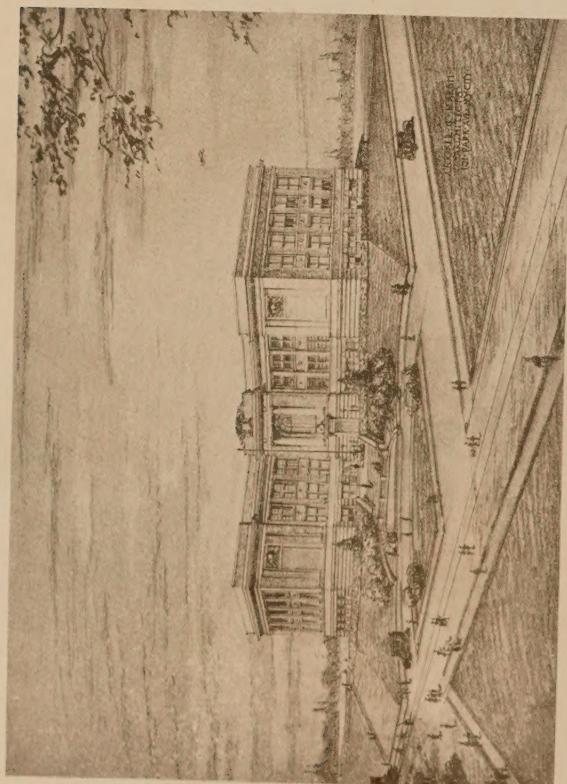
If his own investigation should dictate the wisdom of some change from the plan outlined to him in the beginning, he should place before the proper authorities such suggestions as he may have for betterment, and thus unite with them for the best ultimate results.

The architect must create a building not only of architectural merit, but also one which is practical within itself and in relation to the system of which it is a part.

When an approximate geographical location for the new building has been determined, the next step is to select the site itself. The following points should receive careful consideration:

- First.*—Area. The plot should be large enough not only to provide for future additions, but also for ample play areas.
- Second.*—Orientation. Exposures should be selected so as to eliminate north light as far as possible, except in special rooms.
- Third.*—Sanitation. The plot should have good natural drainage, or lend itself to a modification of existing grades to accomplish same.

Each locality has its own requirements, which may differ in the number and variety of rooms, or may be due to the site itself. It is the exception, rather than the rule, that two schools can be built from the same set of plans. There has been considerable talk of standardizing schools, but this would not be feasible in the majority of cases. This statement does not, however, apply to some of the larger cities,





Pupils' entrance, grade school, Hartsdale, N. Y. Tooker & Marsh, Architects. Arthur W. Coote, Associate.

where standardized plans have been perfected. In these cases the sites are uniformly level, rectangular, and the environments are similar. We are now speaking of the moderate-size building in an average town or city. The mistake in the past has been, to a great extent, that the environment of the site has not been given proper consideration, and, to put it mildly, the result has not been so successful as it might have been.

School architecture is taking long strides to the front, and the public is being benefited thereby.

Frequently the problem of enlarging old buildings is presented, and, more often than not, the architect finds that the original scheme has not been planned for this enlargement, and considerable alteration becomes necessary. This lack of foresight has cost many communities large sums. In laying out the building for future extension, these points should receive major consideration:

- Stairways should be located so as to be independent of the additions.
- Boiler and coal rooms should be of sufficient size to accommodate future boilers and coal storage.
- Steam mains and ventilating ducts should be run to the points of future extensions, of ample size to supply the ultimate demand.
- Administration and toilet rooms should be located with respect to the ultimate development, rather than the first unit.

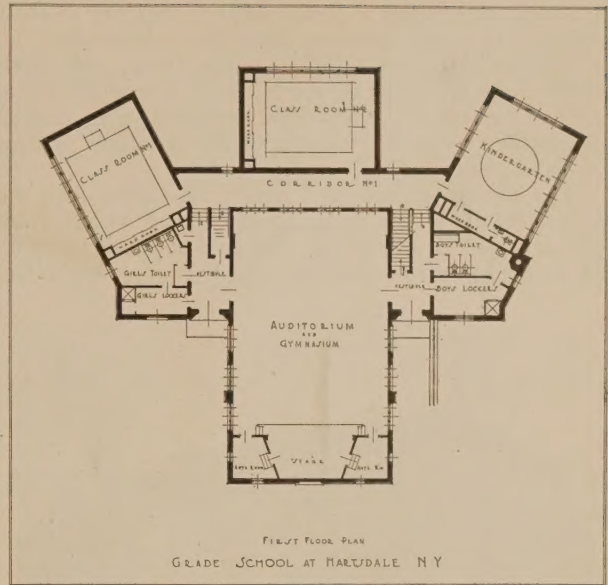
Another problem which occasionally confronts the architect is the stone wall of fixed ideas wrongly instilled in



Auditorium, grade school, Hartsdale, N. Y.

the minds of his clients. This is a difficult situation to overcome, as the clients (boards of education) are usually composed of laymen who look to their paid assistants to administer the details of the school system and to make recommendations for its improvement and growth. Considerable tact must be exercised to overcome this situation, but it should be approached with the thought in mind that the result of an architect's work will outlive many boards of education and their assistants.

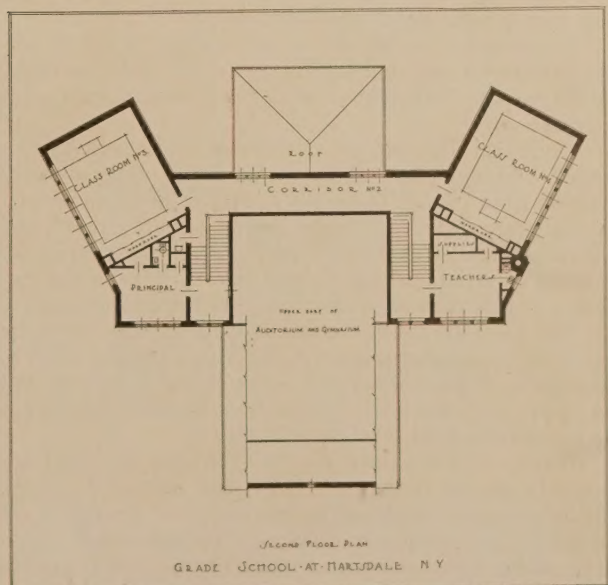
The subject of standardization is too broad to be fully



covered in this article. There are many phases to this problem, and at present, in many States, incorrect standardization is doing fully as much harm as under-standardization in others. An instance that may be cited is that of classroom floor area per pupil. A minimum of 15 square feet is allowed in some States, without regard to age of student or use of the classroom. This area is not sufficient for proper seating of high school pupils, where 18 square feet should be prescribed as a minimum. In some States the requirements have been worked out separately for primary, grammar, or high school purposes. This point should be borne in mind when a programme for a competition is framed, so that the best plan may be obtained, which is not always the case when architects are arbitrarily held to a fixed area for all types of rooms.

Ventilation requirements should be uniform, but heating requirements should vary with the location.

Schools generally are coming into use as community centres, and this point should be given proper consideration by planning auditoriums with easily accessible entrances and



exits. A stage, of a size to accommodate scenery for amateur theatricals and dressing-rooms, should also be included.

All exterior exits should be equipped with panic bolts. Exterior steps should be eliminated as far as possible where snow and ice occur. All fool-proof devices possible, such as key switches controlling electric lights, fire-alarm system, etc., should be included.

The location of lockers is largely dependent upon the general scheme of the building, which may warrant centralizing lockers on the ground floor or in separate rooms on each floor, or in a row along the corridor walls. Individual



Combination grade and high school, Port Henry, N. Y. Tooker & Marsh Architects. Arthur W. Coote, Associate.

wardrobes are universally approved for "home seat" classrooms. These wardrobes should be located at the rear of the room to afford uninterrupted blackboard space at the front and to facilitate supervision of the students while using the wardrobes. Umbrella pans of zinc should be built in each wardrobe.

Sanitation and economy require a simple treatment of the interior of the classroom. This is effected by keeping woodwork at a minimum, by using plaster reveals for windows, and metal corner beads for other exterior angles, and by using no trim other than scribe mould, except for blackboards, picture-moulds, wardrobe fittings, etc. Door saddles should be eliminated and the joints between the classroom and corridor floors formed by means of a metal angle with top of leg flush with the floor. Walls should be finished with hard plaster rather than sand finish.

Classroom doors should be self-closing, to assure perfect ventilation and quiet. Transoms should be movable, for the purpose of ventilation when the plenum system is not in operation.

Unilateral lighting of classrooms is universally approved. Groups of windows are advisable, thus avoiding shadows from piers. There are a number of types of windows in general use, such as double-hung, unit, pivoted, and counterbalanced. The latter type has the advantage of allowing a partial opening without direct drafts on the students. It also permits of cleaning from within the room.

The most approved method of shading windows is by means of two shades located at the centre of the window, one overlapping the other, the lower shade to pull up and the upper to pull down. Shades may be boxed to darken the room while a stereopticon is in use.

Blackboards of natural slate are the most approved and should be placed at the front, side, and rear of the room. The height of the chalk-rail is determined by the age of the student. The blackboards should not be higher than necessary, as the larger amount of black surface means greater absorption of light.

Hardwoods, such as maple, beech, and comb-grained pine, are the best for classroom floors. Corridor floors and stairways may be treated in many ways, the most economical of which is by means of a cement finish which should be treated with a dust-proofing cement hardener. Terazzo, plastic composition, and tile are more expensive, but have a better appearance. Battleship linoleum, cemented over the entire surface, has proven very satisfactory. It is less expensive than either terazzo or tile and has the added advantage of quiet.

The wainscoting in corridors should be either tile or glazed brick. However, if the cost of same is prohibitive, Keene's cement will prove satisfactory.

It is advisable to have toilet facilities on each floor. Automatic water-closets are in universal use, some with pressure tanks and some with flush valves, where the water pressure is within workable range. The material for toilet partitions may be Alberene stone, slate, marble, metal, or wood; wood being the least desirable. Toilet-room floors should be of cement, plastic composition, terazzo, or tile, with the wainscot of tile or Keene's cement.

The matter of heating and ventilation should be placed in the hands of a competent engineer. To economize on the heating plant is a serious mistake. Vent flues should, preferably, be located at the floor, with no grilles, for better ventilation and for cleaning. Heat flues should have diffusers to distribute the flow of air at a lower velocity over the entire surface of the opening, avoiding a high velocity at the top. Heat flues should be sufficiently large to keep the air flow as near gravity as possible, in order to avoid cold drafts late in the day when, usually, the janitor allows his fires to drop.

This point was well proven in a city where the president of the board of education is a throat and nose specialist. When the schools opened he noted the great increase of children patients with head colds. When a new high school was built, two heat flues and two vent flues were installed for each classroom, but this did not prove entirely satisfactory. Uniform gravity distribution of tempered air was the solution, in his opinion. This, of course, was physically impossible. When the last grade school was built, however, a series of four heat and four vent flues was installed for each room, so arranged that they alternated the length of the room, and so designed that the air was forced into the room at a velocity of not over 210 feet per minute. This school has now been in operation for over four years, and the result has been almost perfection. This, of course, is an expensive construction, but proves that too great a velocity is a bad feature.

The foregoing article has, necessarily, treated the subject of school planning and construction in a most general manner. Architects will find much to interest them in the subject of modern school design. The field is large, and the problem varied.



Entrance detail, school, Glens Falls, N. Y. Tooker & Marsh, Architects. Arthur W. Coote, Associate.

The Importance of Good Design in School Building

Ernest Sibley, Architect

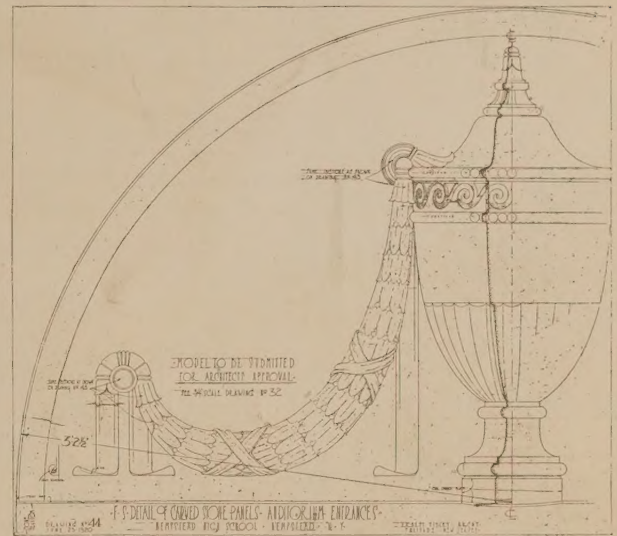
THERE is the obligation on the part of the school architect to thoroughly acquaint himself with the fundamentals of school organization and administration, and to keep pace with the rapid progress of modern school ideas, not only in study and recitation, in shop work and laboratories, but in physical training and social development.

The school architect can plan successfully only if he has constantly before him as he works a vision of the completed building, equipped, occupied, and in full operation, fulfilling every mental, moral, physical, and social need of the students within its walls. Then, and only then, does school planning cease to be a mechanical problem, based on certain fixed standards, and become an important, interesting, and inspiring occupation.

While school planning has advanced considerably in the past few years, school design has not always kept pace, for there is admittedly a smaller proportion of well-designed schools than almost any other type of buildings, notwithstanding the fact that good design is fully as important in this as in any other class of work.

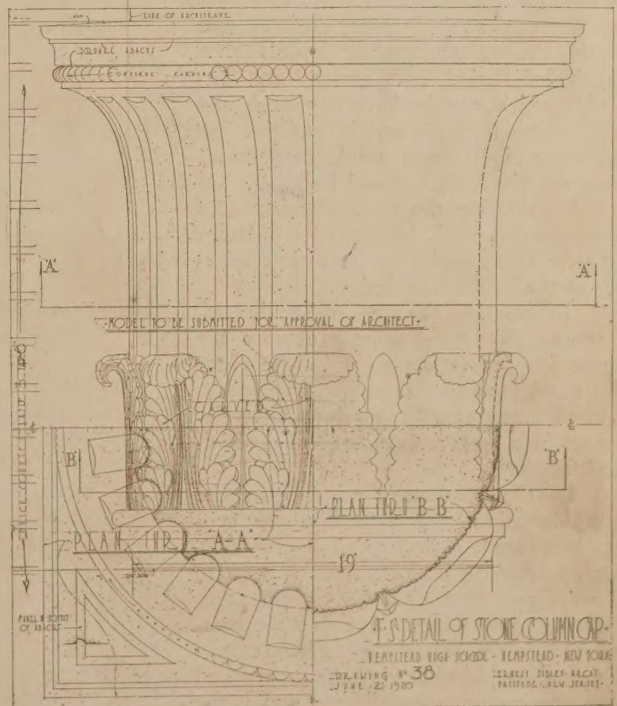
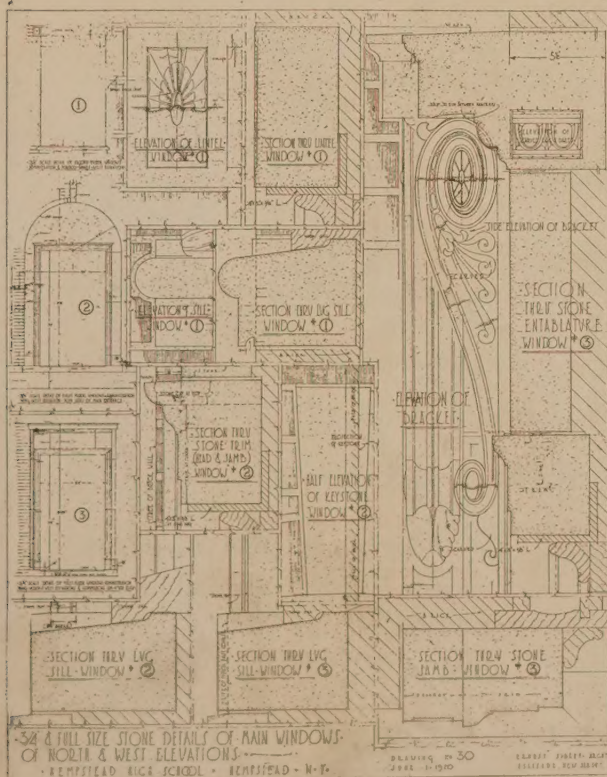
Children attend school during the formative period of their lives, when the impressionable, receptive mind is favorably influenced by beauty of design and pleasing color schemes, and in a logical and natural way may begin their education in the recognition and appreciation of good architecture, that least appreciated and respected of the fine arts.

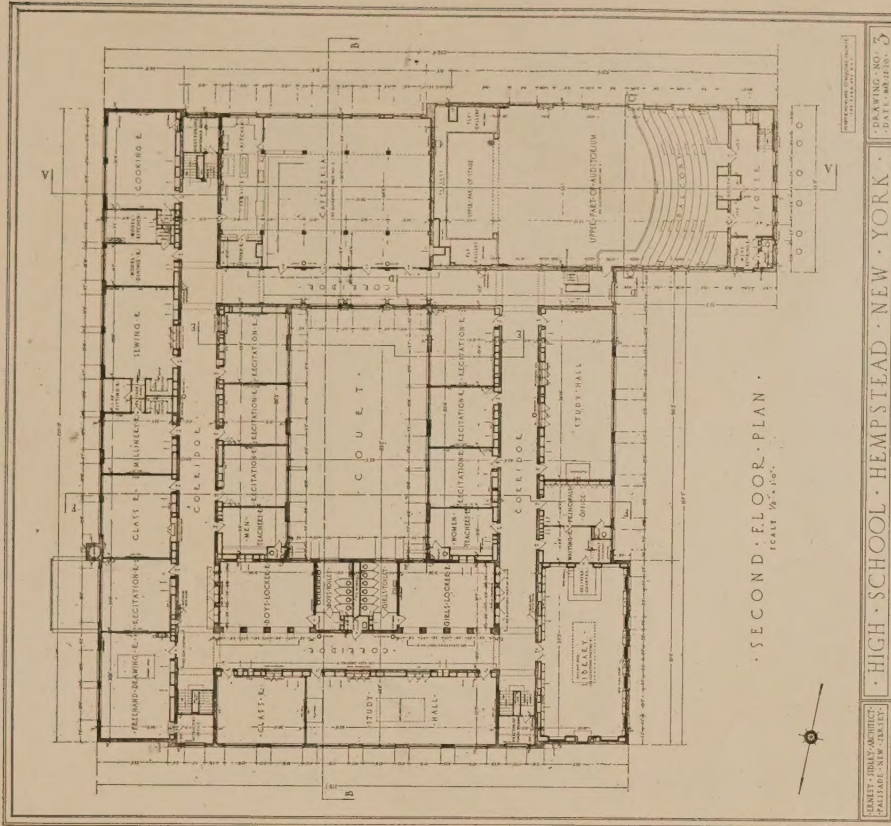
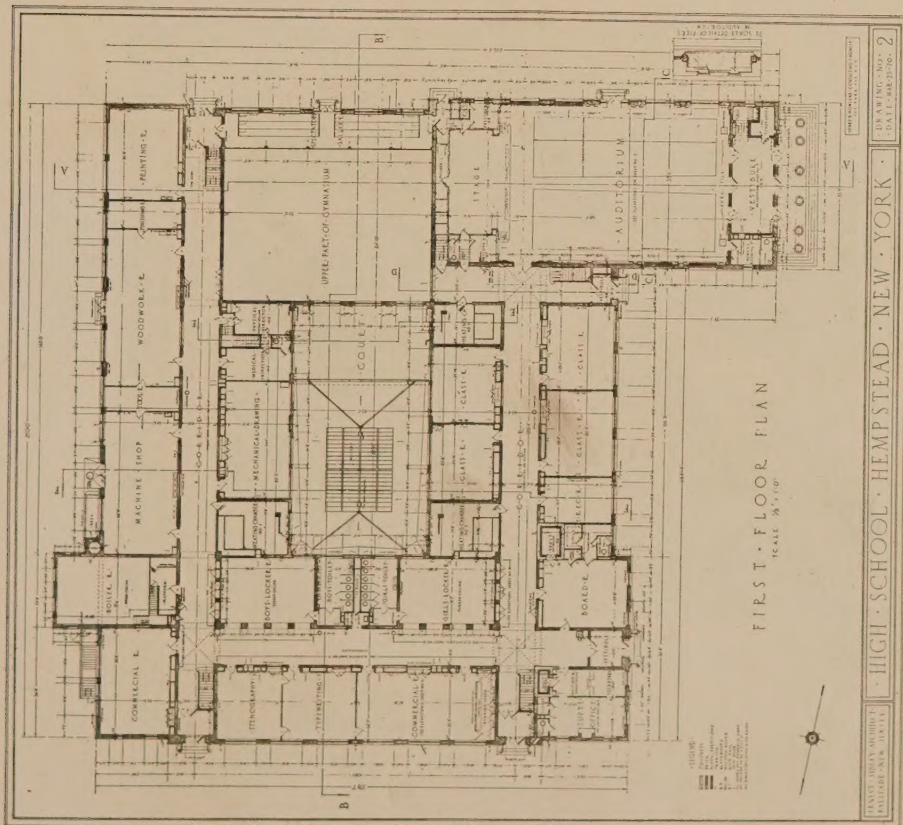
The plan of the Hempstead high-school building is a natural solution of a problem growing out of the expressed



desire of the Board of Education and the Superintendent of Schools to give to the children of the district the best possible training in the scientific, commercial, industrial, and household arts departments, as in academic work, with every advantage, innovation, and convenience for obtaining such training that could be secured without building a vocational school. Coupled with this was the plan of making the school an educational and recreational, as well as a social, centre for all the people of the community.

The first step in the development of the design was the

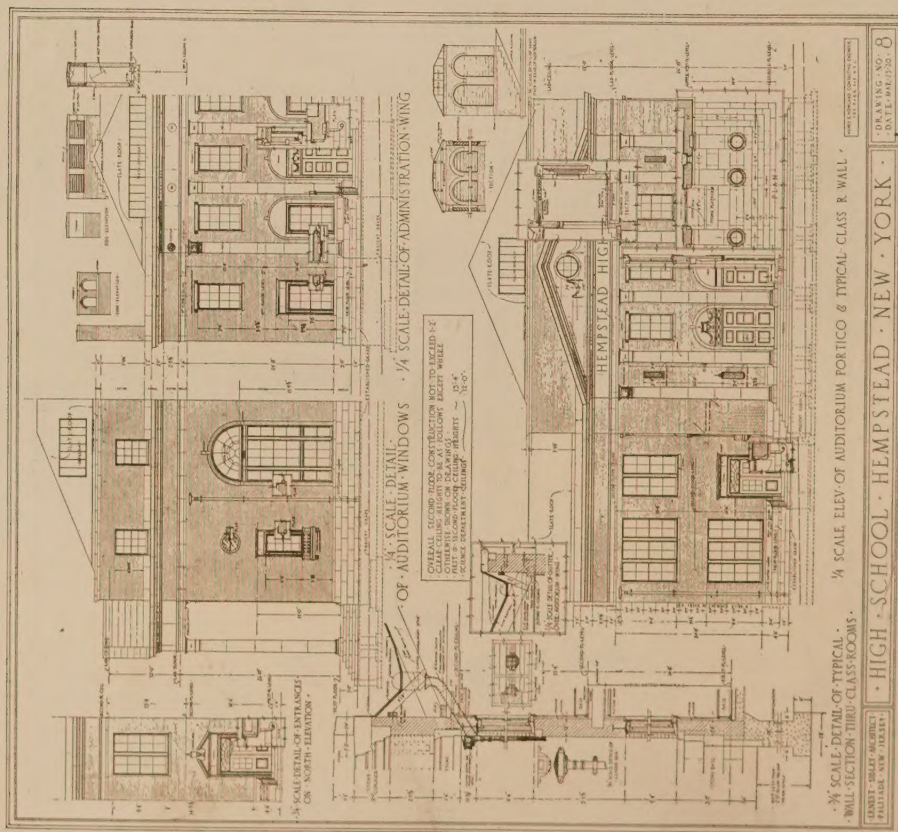
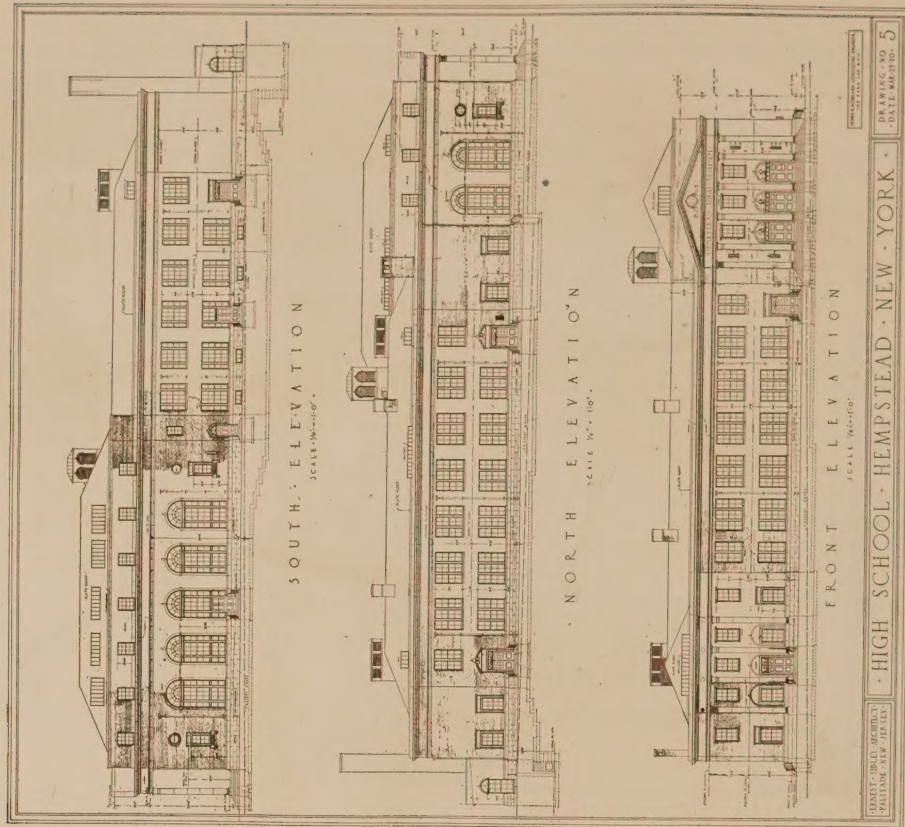


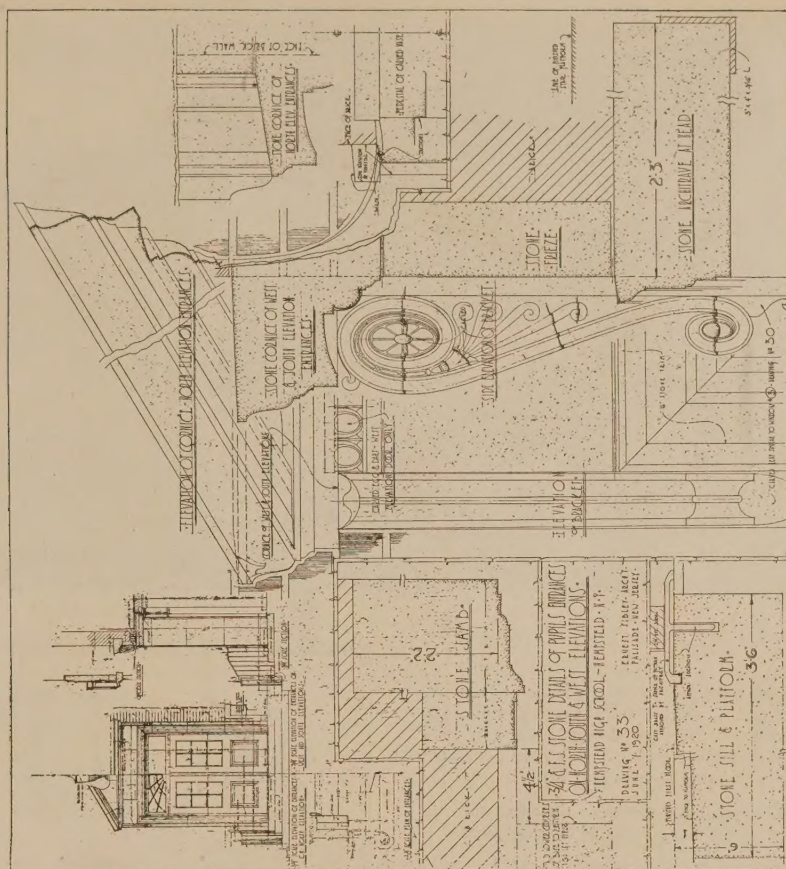
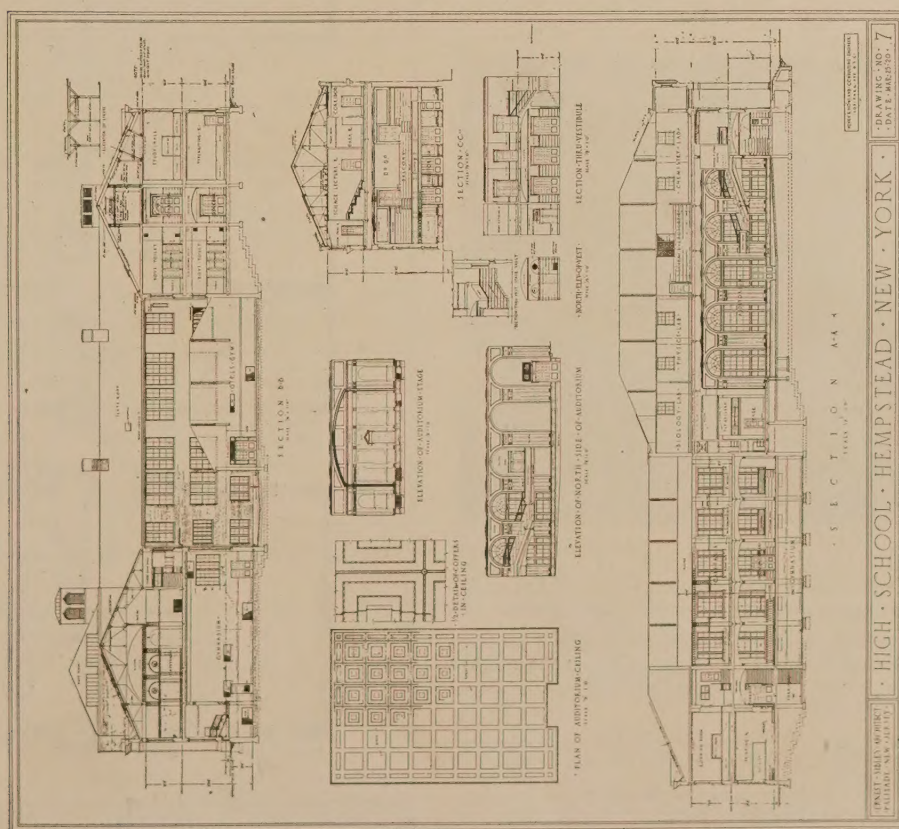


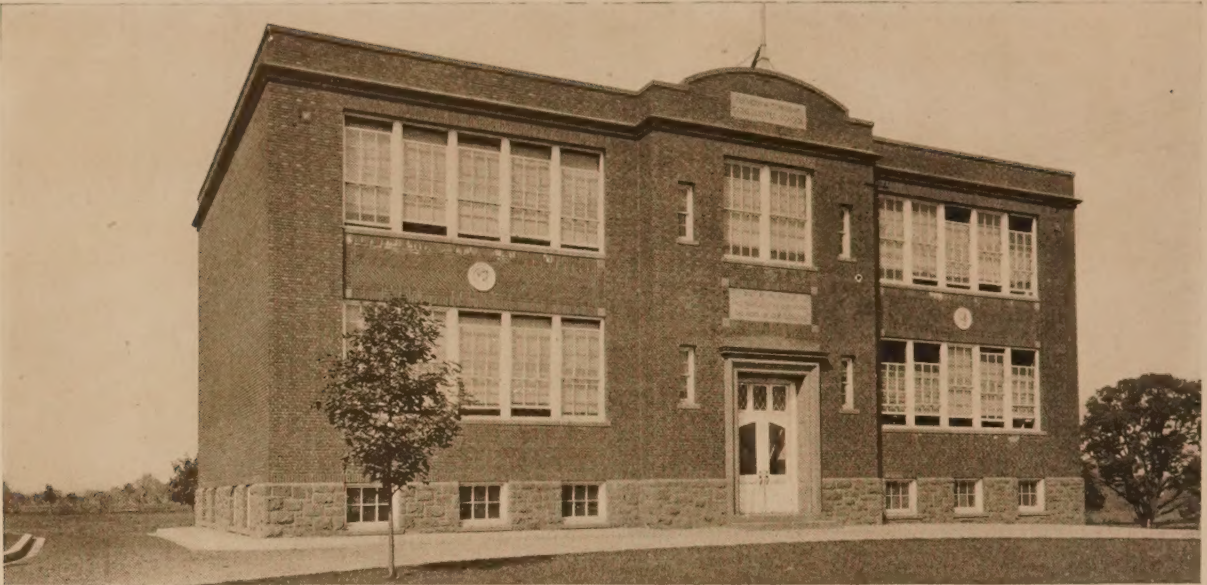
in carrying out the architect's intentions in the Hempstead school. The desire was to attain a pleasing first impression of the mass, quite apart from any consideration of the many details. The cut cast-stone base and cornice have the appearance of white marble, and the brick used are harmoniously varied in color ranging from light shades of red to salmon shades laid in Flemish bond. Above the cornice one gets glimpses of the slate roof in varied tones of green and purple. The unsymmetrical treatment in plan and design is as charming as it is unusual in school architecture.

Consistent effort has been made to express in every detail of the building the simplicity and refinement of the best work of the period. All details have been carefully studied for character and scale, and models of the most important studied in the shops.

The planting about the school promises to be of unusual beauty, and as well of practical interest and value, as it will serve a special purpose in the studies of the classes in botany.



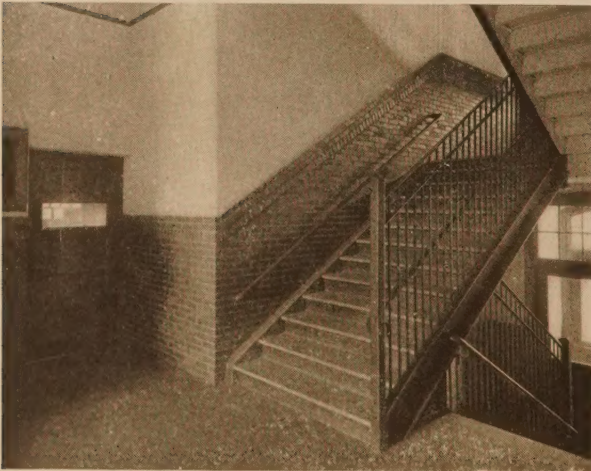




WARDROBES AND CLOAK-ROOMS.—Separate cloak-rooms should be provided for each classroom and should have direct outside light, and should be heated and ventilated. The cloak-room should be connected to classroom only, so that it is constantly under the eye of the teacher. Two doors should preferably be provided.

Wardrobes may be used where it is desired to reduce size of building. They should be placed at the side or rear of the classroom.

Blackboards may be provided in the doors.

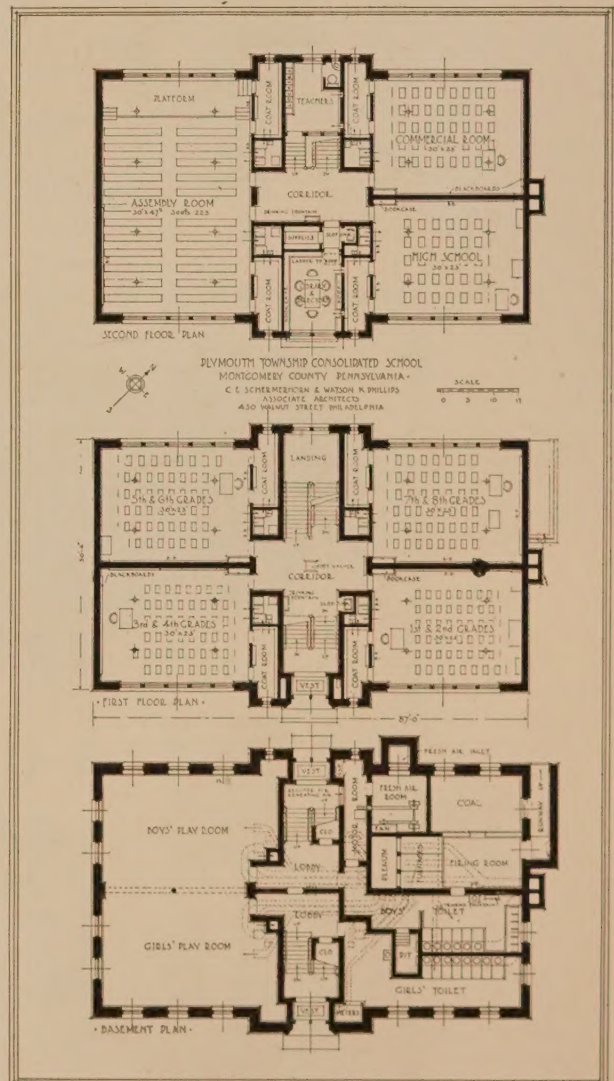


STAIRWAYS AND HALLS.—Stairs should be not less than 4' 0" or over 5' 0" wide for each run. Treads should be 11" wide and from 6 3/4" to 6 3/4" high on the carriage. Return stairways should have division walls high enough to prevent any one from climbing over.

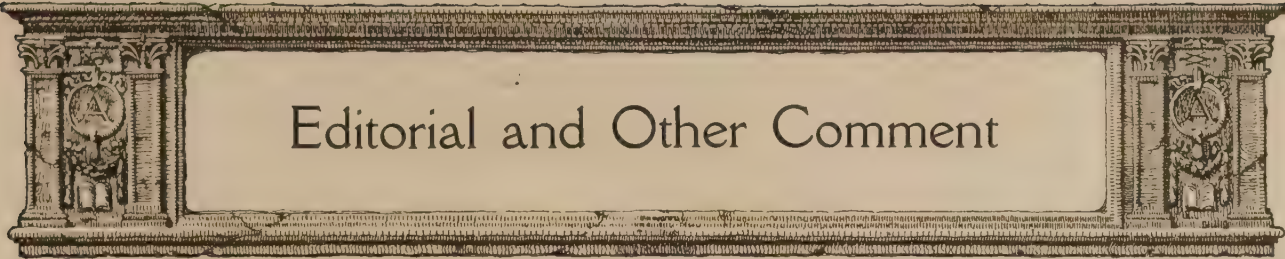
Hand-rails should be about 2" in diameter, supported on iron brackets and set about 2" from wall. Ends should always be returned to prevent clothing from becoming caught. Rails should be from 2' 0" to 2' 4" above tread at riser line.

An inexpensive method of wainscoting halls and stairway walls is to use a semi-glazed brick, built in at the time the wall is erected.

Battleship linoleum makes a good floor-covering. It is quiet, easily kept clean, wears well, and looks well.



Plymouth Township Consolidated School, Montgomery Co., Pa.



Editorial and Other Comment

Our School Architecture

THERE is probably no class of buildings that has shown a greater advance architecturally than the public school. Certainly no buildings that are constructed can have a greater potential value in the cultivation of good taste and appreciation of good design, combined with adequate and thoroughly practical planning. The demand for new schools all over the country is insistent, and they are going up as rapidly as conditions will permit. With very few exceptions the new buildings show the desire, both upon the part of the architect and the community, to make the school something of a monument, a source of local civic pride in keeping with the part that education plays in our national life. Some of us who recall the old school buildings of the past, their generally ugly exteriors and dreary and ill-arranged rooms, their limited opportunities in the way of heating, will envy the young folks of to-day, whose privileges of study and places to study offer, it would seem, only pleasant ways in which to acquire an education.

The wonder of these modern schools lies not alone in their merely scholastic privileges, but in their really remarkable equipment for teaching practical things.

The problem of design has grown with the growth of the new needs of teaching, and certain fundamental needs are a part of every school building. In the article by Mr. Marsh these needs are made clear, and Mr. Sibley has admirably accented the care and knowledge and purpose with which the purely æsthetic aspect of the school building is regarded.

It would be well if the pupils who are fortunate enough to be taught in these beautiful modern schools could be told something of their architectural interest, to have pointed out the meaning and origins, for instance, of the decorative details, and something of the significance and meaning of the plan.

What better object-lessons for the classes in drawing, in the study of ornament, in the history of architecture, than the building in which they daily spend the hours in study. We hear too often that the architect has no place in the world any more, that his position is only that of a builder of buildings, that there has been too much prating here and there about his training as an artist and too little about his practical sense. These ideas have been expressed by architects rather than by laymen, but the times have been out of joint for the humanities in general. The only way to get old joints right is to come back to a belief that, after all, the true, the good, and the beautiful are as necessary in the progress of civilization, as practical in their ultimate results, as some more immediately cashable things.

We look to the teaching in public schools to help in the great problem of Americanizing our mixed peoples; why not make the buildings themselves a part of the teaching of an appreciation of architecture?

We regret that space limitations have compelled us to hold for the next issue several schools we had hoped to use in this number.

Graft

THERE is little new to be said to the architects with regard to the revelation of graft in the building trades. No one is surprised, we dare say, at the general statement of a system that is all-pervasive, that has been perfectly understood and accepted more or less as a necessary part of present-day conditions.

An architect was saying recently that some co-operation and organization among the manufacturers and sellers of building materials was necessary to prevent cutthroat competition and general demoralization. But this is quite a different matter from the buying and selling of privileges to actually do business at all. We shall all watch the various disclosures with interest, follow the ramifications of the graft bug to its lair, and probably, as in many other things that seem at the moment important, go on in the same old way. Apparently all the investigating in the world and the moderate punishment, now and then, of some specially flagrant dishonest procedure, will not do much good unless we can bring to life some better ways of doing business. We have not progressed evidently, nor learned better ways, since the times of the notorious Sam Parks.

Mr. Untermeyer, before the Joint Legislative Committee on Housing in New York, said, "There is enough here to keep us busy for six months," and *The New York Herald*, in an editorial, remarks:

"Indeed there seems to be, and evidently there is, enough there to keep somebody busy in Sing Sing prison for six or sixteen years. New York is awakened to the fact that although Sam Parks is dead, the infamous thing he personified is still alive and more active than ever. The public is not in as patient a mood as it was seventeen years ago. Then there was no building shortage. Now every strike that is declared for blackmailing purposes is a crime against public health and comfort. Let us see who runs the building business of this town. Is it the builder or the black-mailer?"

But when we see, what are we going to do about getting rid of a system that has been as much a part of our buildings as the materials that go into them?

Some Practical Suggestions for the Draughtsmen

By *David B. Emerson*

AT the present time, in the general unrest which is affecting all industry throughout the country, we hear many complaints about the small rewards in architecture. This is naturally forced home by the high cost of living and the greatly decreased buying power of the dollar; but the fact is, architecture never was, and probably never will be, highly remunerative, and the architects who have made fortunes in the practice of their profession have been comparatively few.

A large number of young men, and some older ones, have left the profession of late, and many more are debating on doing so. Now, if any young man who is working in architecture feels no more enthusiasm for his work than he would if he were selling automobiles, or in the stock brokerage business, he would certainly do well to quit architecture at once and find some other employment where the monetary rewards are greater and come more quickly. But if a man can say, as the writer remembers hearing the late John M. Carrere say, at an atelier smoker, "Architecture is the bulliest thing I know of," then there is something in architecture which makes it worth while staying for, something which makes a man willing to make a little less money to be happy in his work. Of course, it is very nice to follow an enjoyable occupation, but every one, no matter how great his enthusiasm and how much he may be devoted to an art, is desirous of getting all that he possibly can in return for his labor. Therefore, the purpose of this article is to show the younger men, those who have recently left college and are beginning their life-work, how to best accomplish that.

The natural ambition of every young man who enters architecture is to become an architect and to have his own practice, but all cannot attain this, and even after it has been attained all cannot continue—so always a great many men will have to be "just draughtsmen." A few years ago the majority of the architects labored under the assumption that all draughtsmen were potential architects, and paid them accordingly, but to-day it is being recognized that the professional draughtsman is a necessity, and without the draughtsman there cannot be many architects; consequently the condition of the draughtsman is bound to improve.

Inasmuch as architecture is a work of thought and mental effort, the levelling process of the labor unions can never be applied to them, and men will always be paid for what they know and what they can do; so the more they know, the more they can do, and the better they can do it all, the better they are bound to be paid. This being the condition, it behooves the young man to put himself in the position to obtain steady employment at a high salary. How can this be done? The exceptionally brilliant designers will always be paid very well, and will always be in great demand, largely because there are so few of them.

As designers are born and not made, many good, earnest, devoted draughtsmen must be content to follow on,

and although their names will never be writ on the tablets of the architectural hall of fame, their work can be made of inestimable value in the execution of the design; for, after all, "the building is the thing." The young men who come from our architectural schools are practically all of them able to make very good presentation drawings, but they have no adequate idea of working drawings, and unfortunately underestimate the value of such work in the practice of architecture. For this reason young men, who have never had the advantage of school training, are frequently of much more value in routine office work than college men whose knowledge is far greater but who cannot put that knowledge to a practical, every-day use.

In the light of these facts, for facts they are, it is well for the young man just out of college, who sees a fairly long period of work as a draughtsman ahead of him, to learn to make good, clear, and concise working drawings, using standard indications of materials and standard symbols whenever possible, and carefully indicating all materials on the drawings. Too much stress cannot be put on the importance of plain, neat, legible lettering, and, above all, legible, well-formed figures, which can be easily read and which are so placed on the drawings as to show at a glance to what they refer, for more trouble ensues on the work from improperly figured drawings than from almost any other cause. Also, learn to make letters and figures large enough to be seen and to be read without difficulty, and increase their size on larger-scale drawings. Make a careful study of, and acquire a good general knowledge of, the principles of plumbing, heating, and electric wiring, so as to be able to properly locate all fixtures, piping, etc., on the plans and to allow proper room for boilers, etc.

Visit the jobs and the shops, and learn how work is put together and how to make workable, full-size details which will show the contractor exactly what is needed and no more and no less. Don't try to make pictures of your full-size details and waste lots and lots of valuable time putting artistic lettering on them, and carefully drawing out all of the details of hardware and patented specialties, and showing all the various connections for them, when they will be bought and applied by the contractor, whether they are shown on the drawings or not, and are thoroughly covered in the specifications.

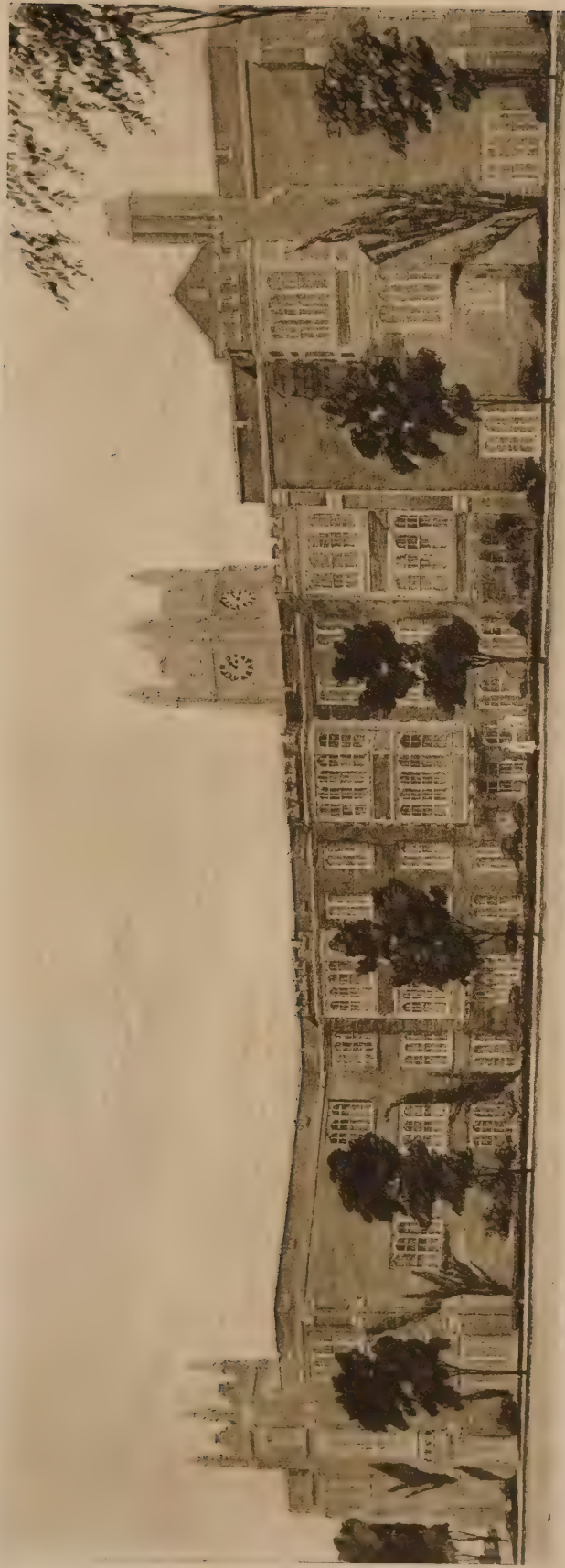
Careful attention to these few, unimportant-looking, but really very important, items will do much toward improving the position of the young draughtsman, and make him more valuable to the architect. After having done these things and thereby becoming an excellent assistant, the next thing to do is to bend all your energies toward reaching that goal which should be every young draughtsman's aim, viz., becoming an architect, and there are still plenty of good seats in the front row for those who are strong enough and determined enough to reach them.





EVANDER CHILDS HIGH SCHOOL, BRONX, NEW YORK CITY.

C. B. J. Snyder, Architect.



DESIGN FOR HIGH SCHOOL, SHEBOYGAN, WIS.

Childs & Smith, Architects.

NOVEMBER, 1920.

ARCHITECTURE

PLATE CLXIII.



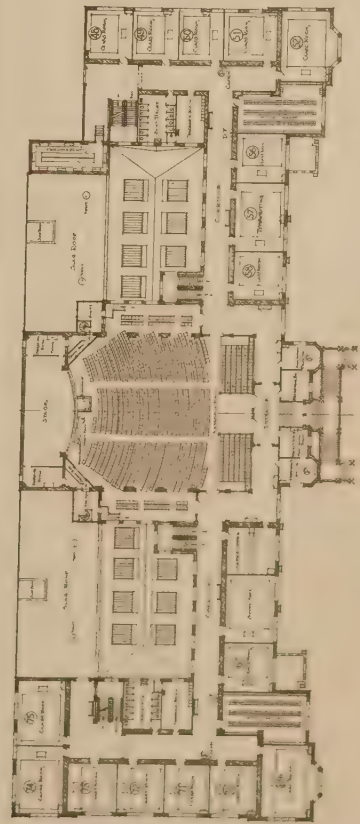
HIGH SCHOOL, RIDGEWOOD, N. J.

Tracy & Swartwout, Architects.

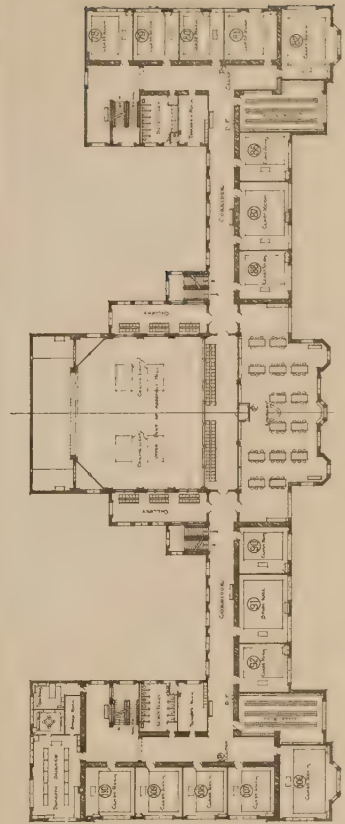


AUDITORIUM, HIGH SCHOOL, RIDGEWOOD, N. J.

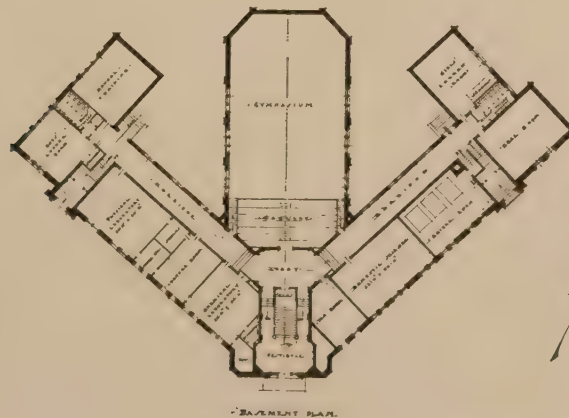
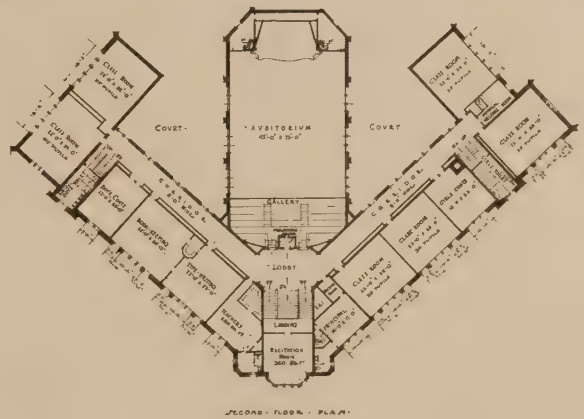
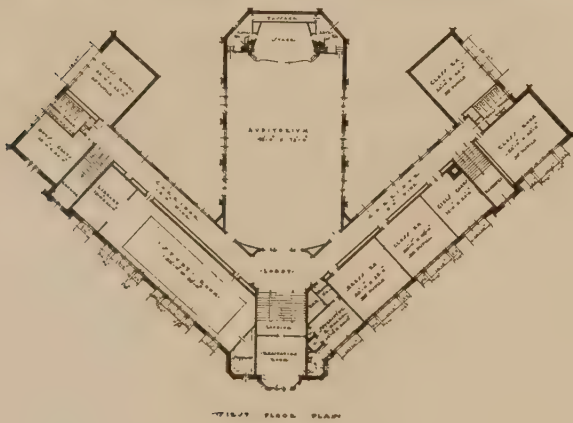
Tracy & Swartwout, Architects.



DUNBAR HIGH SCHOOL, WASHINGTON, D. C.

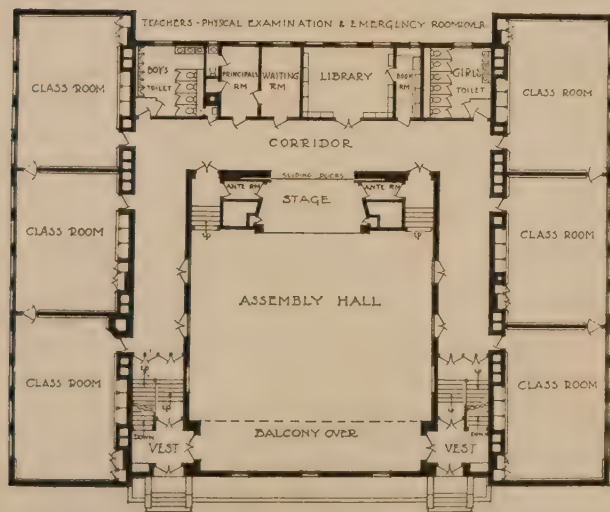


Snowden Ashford, Municipal Architect.

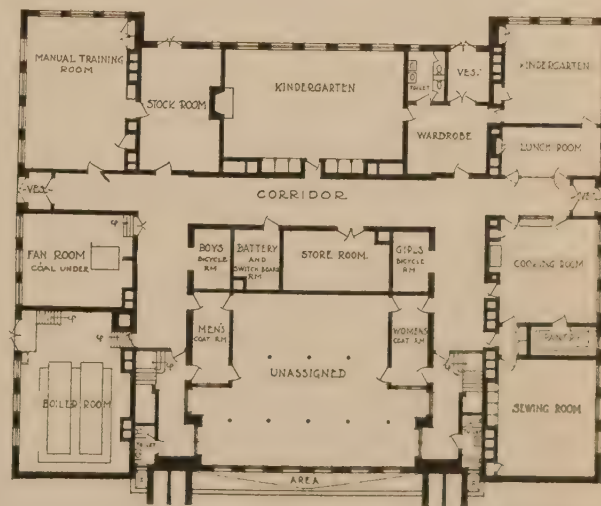


HIGH SCHOOL, PELHAM, N. Y.

Tooker & Marsh, Architects. Arthur W. Coote, Associate.



FIRST FLOOR PLAN



BASMENT PLAN

BANKS SCHOOL
WALTHAM, MASS.

BANKS SCHOOL, WALTHAM, MASS.

Kilham & Hopkins, Architects.

NOVEMBER, 1920.

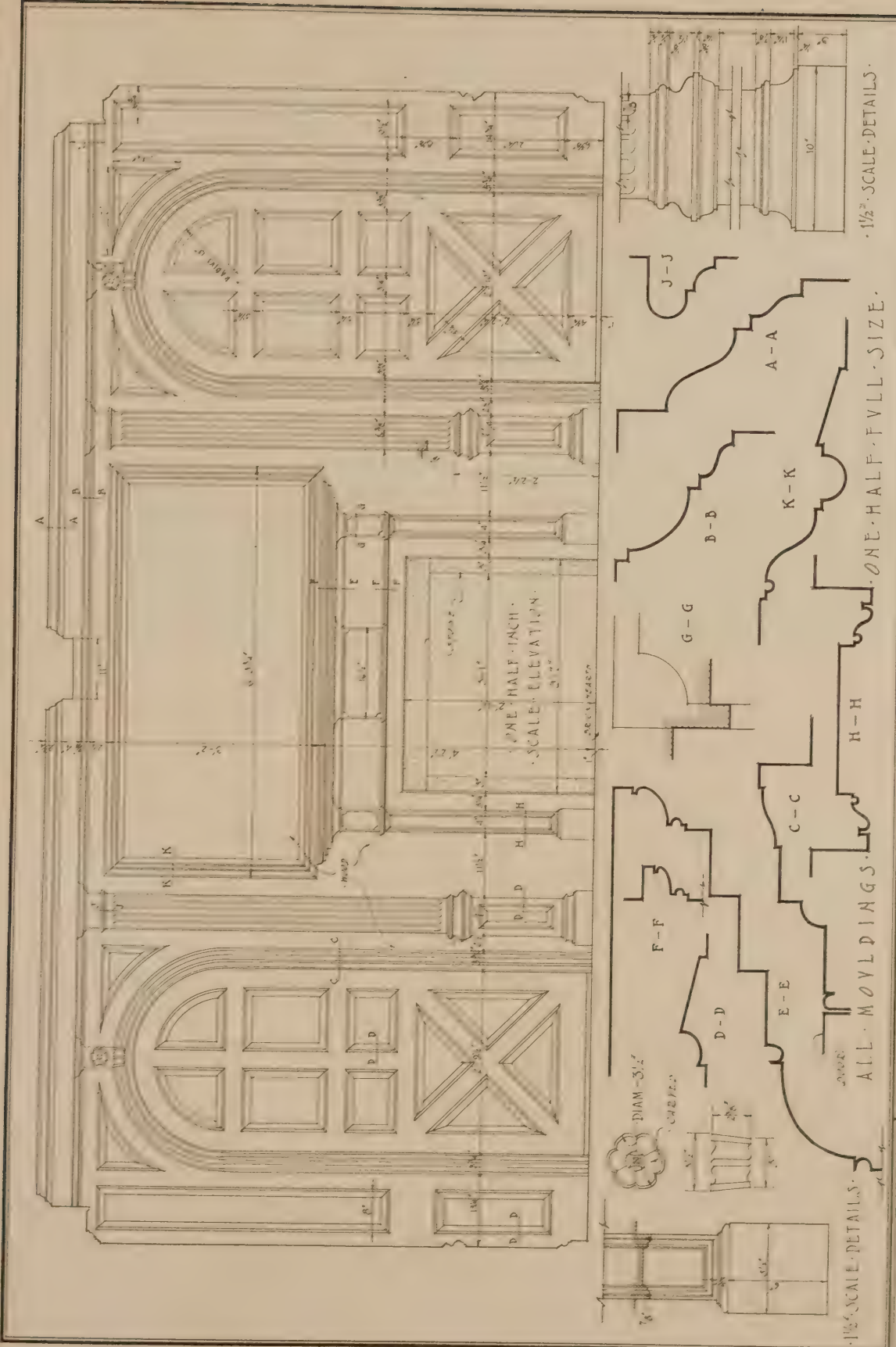
ARCHITECTURE

PLATE CLXVIII.



GRAMMAR SCHOOL BUILDING, ROSEMONT, RADNER TOWNSHIP, PA.

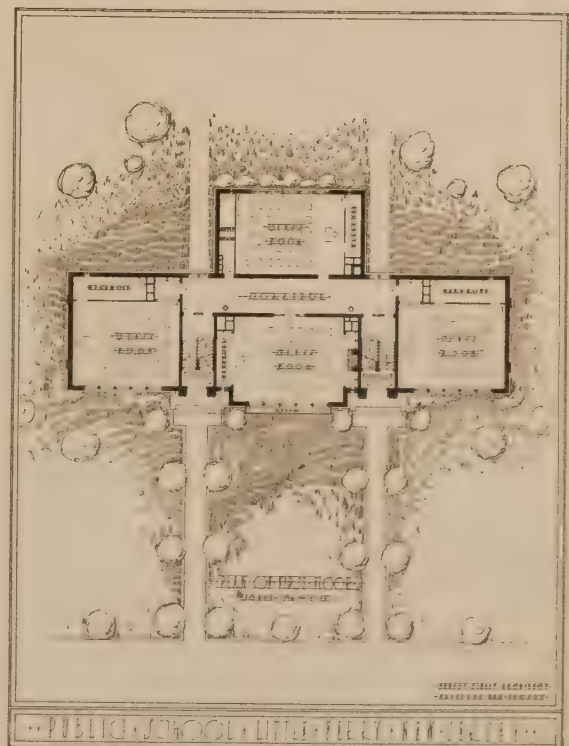
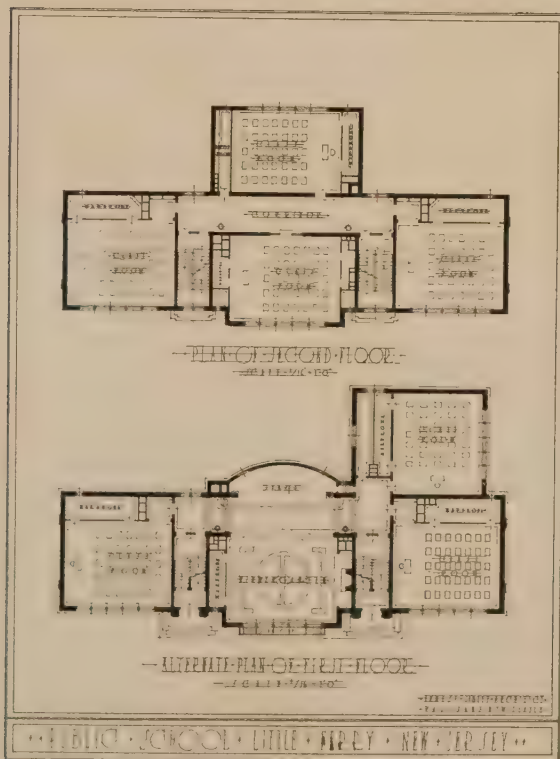
D. Knickerbacker Boyd, John L. Coneys, Victor D. Abel, Architects.



• FARM.
• ARCHITECTURE.
• CT.
• CONNECTICUT.

• PANELLING IN THE PARLOR OF
• THE WEBB - WELLES HOUSE.
• WETHERSFIELD, CONN. DATE, 1753.

• MEASURED BY.
• J. FREDERICK KELLY.
• DRAWN BY.
• LORENZO HAMILTON.



In the school at Little Ferry, New Jersey, the architect has used brick made in the local brick-yards by residents of the town. The brick were moulded and laid out to dry and while still green were struck by a hail-storm and deeply pitted. The result gives an unusually interesting and novel texture to the walls of the building. The trim is of concrete stone and the roof of variegated green slate.



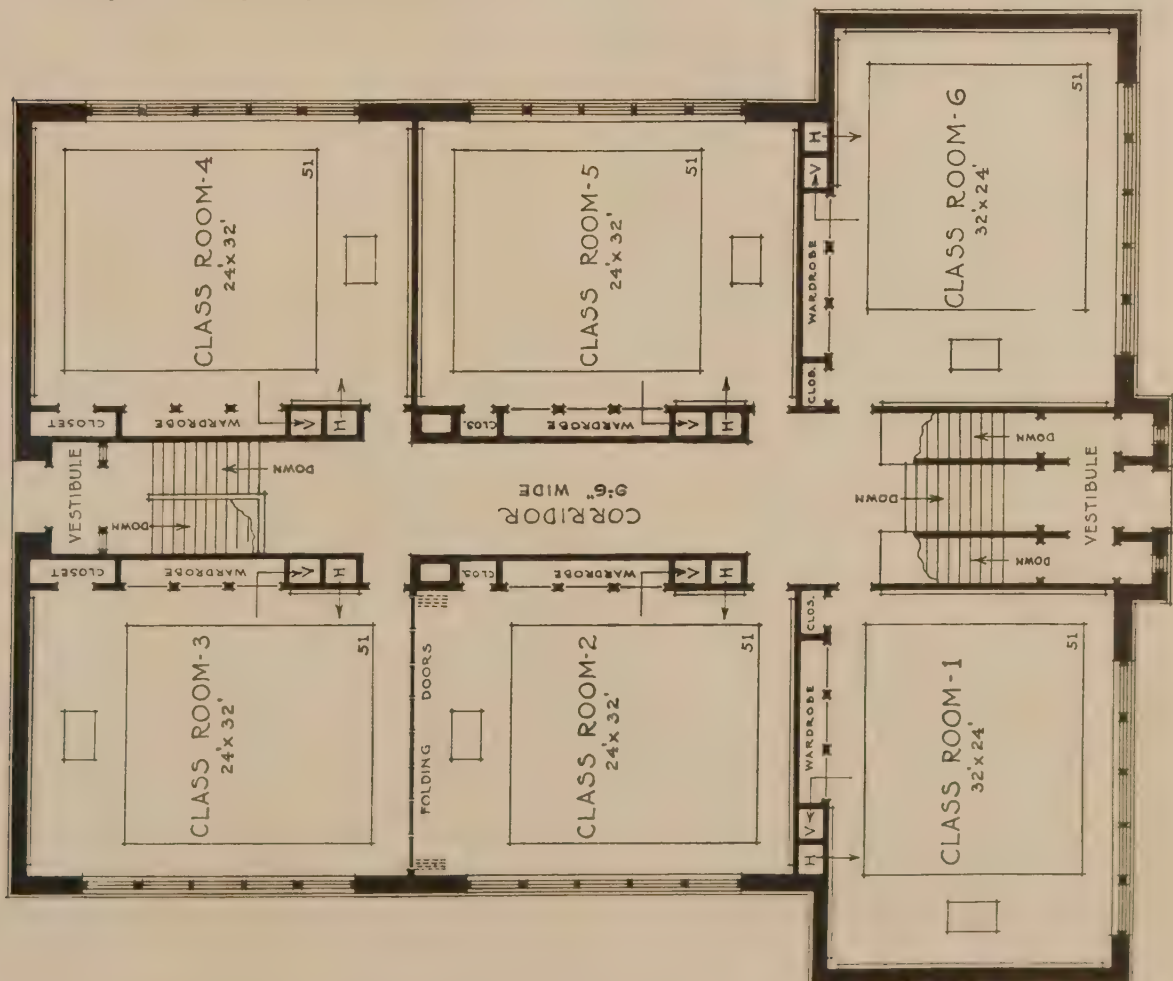
COMBINATION GRADE AND HIGH SCHOOL, TOWN OF GREENSBURGH, WESTCHESTER, N. Y.



FERRIS AVENUE GRADE SCHOOL, WHITE PLAINS, N. Y. Tooker & Marsh, Architects. Arthur W. Coote, Associate.
TWO TYPES OF SCHOOL OF ALL BRICK DESIGN (RECENTLY COMPLETED).



Pivoted sash may be opened wide on warm days, thereby giving maximum ventilation. Shades should be attached to sash, and if this is properly done all direct sunlight will be excluded, even though all sash are open. **SHADES.**—Best colors for shades are light buff or gray. Two shades should be provided for each window, hung at centre; one to pull up, other down. If pivoted sash are used, shades should be hung on sash with twist pulleys for both top and bottom so that shades will always be in tension. This will prevent rattling during sudden breezes.



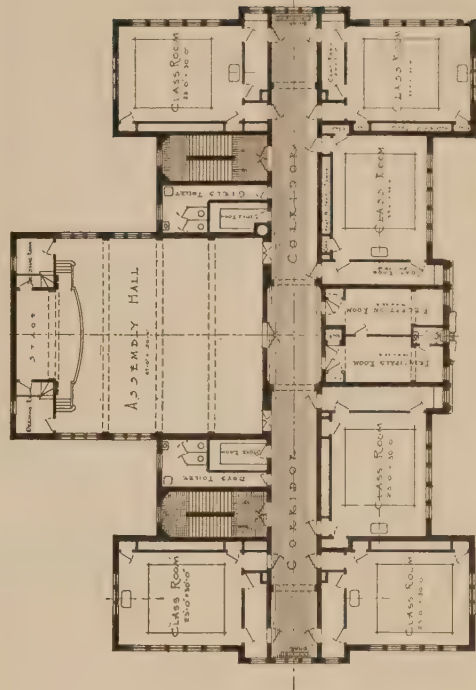
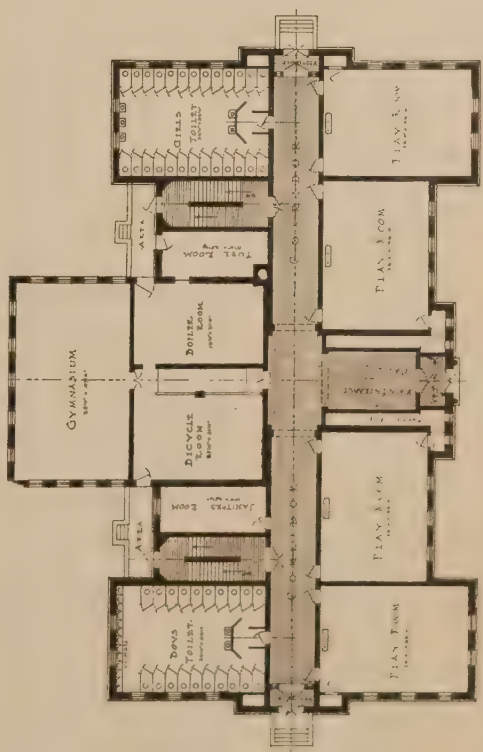
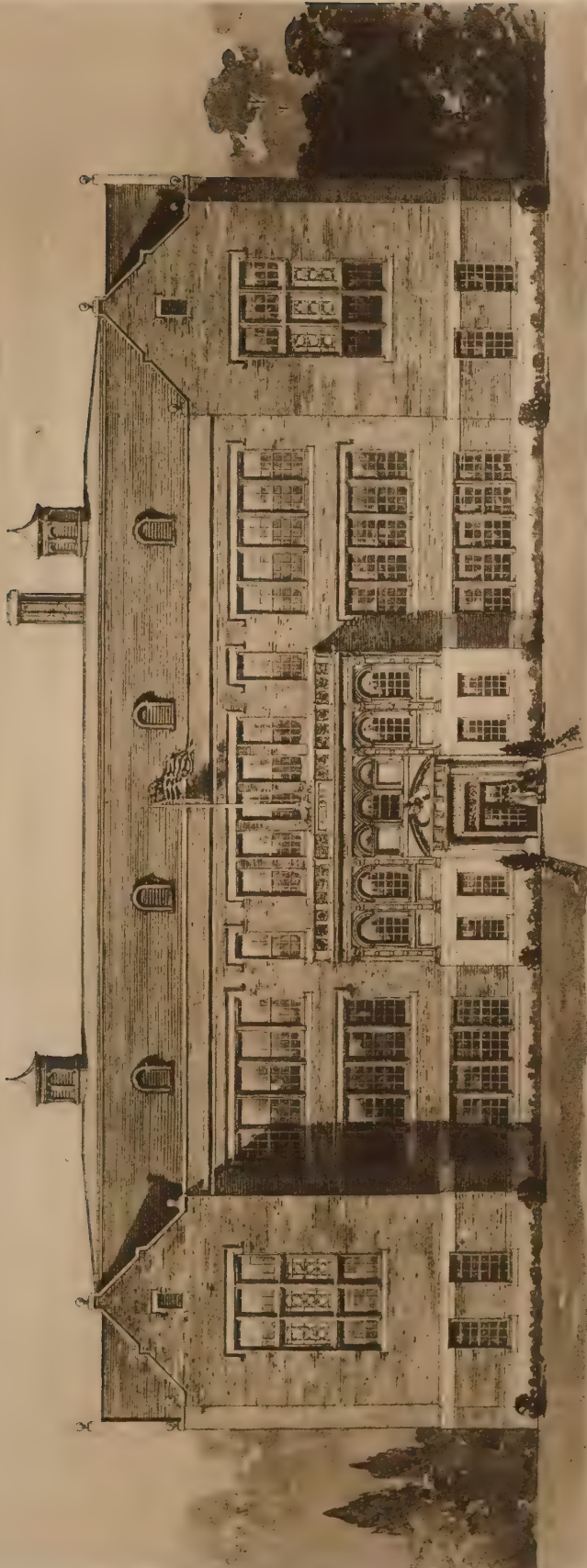
HENRY K. BOYER SCHOOL, LOWER PROVIDENCE TOWNSHIP MONTGOMERY CO., PA.

C. E. Schermerhorn and Watson K. Phillips, Associate Architects.



GRADE SCHOOL AND COMMUNITY CENTRE, HARTSDALE, N. Y.

Tooker & Marsh, Architects. Arthur W. Coote, Associate.



SCHOOL NO. 64, BALTIMORE, MD.

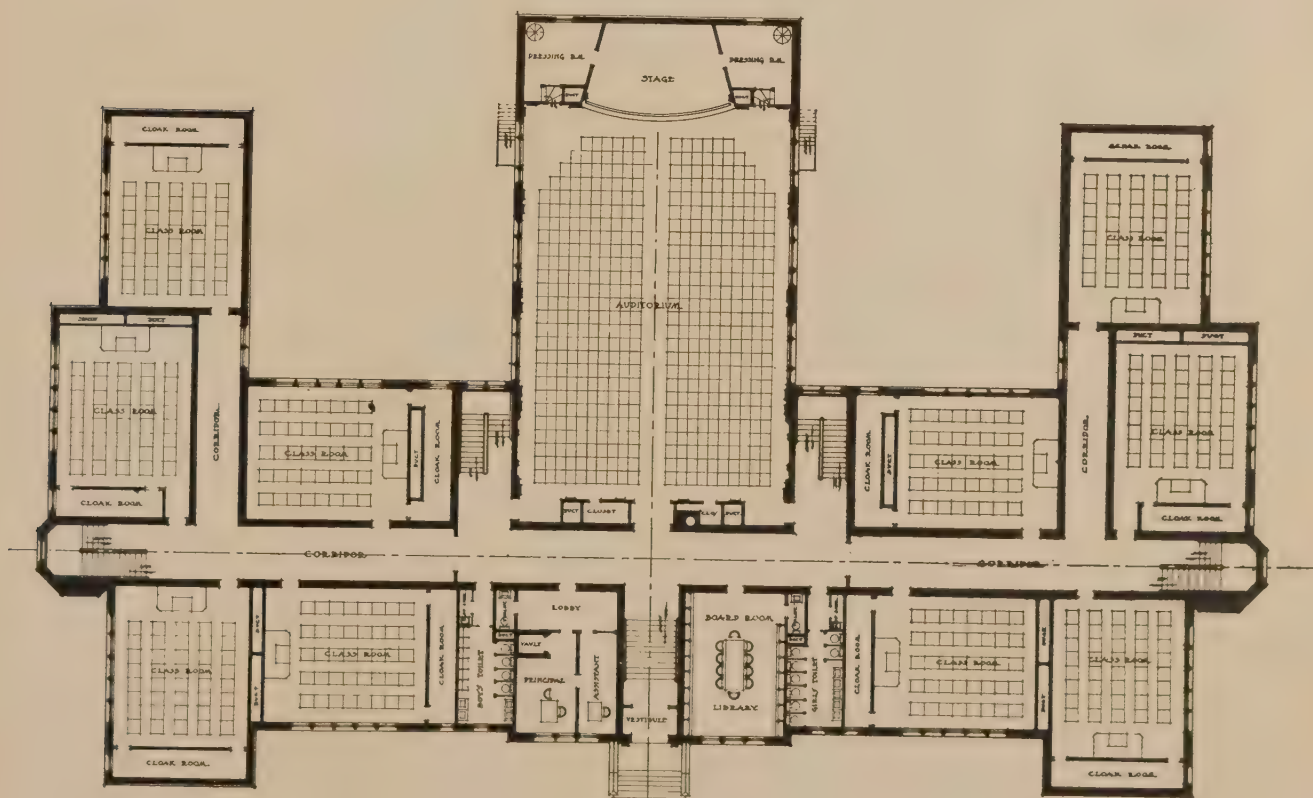
Mottu & White, Architects.



SCHOOL BUILDING FOR CRANFORD N. J.

DATE 6-26-20

HOLLINGSWORTH & BRAGDON
ARCHITECTS
17 WEST 43RD ST. N.Y.C.

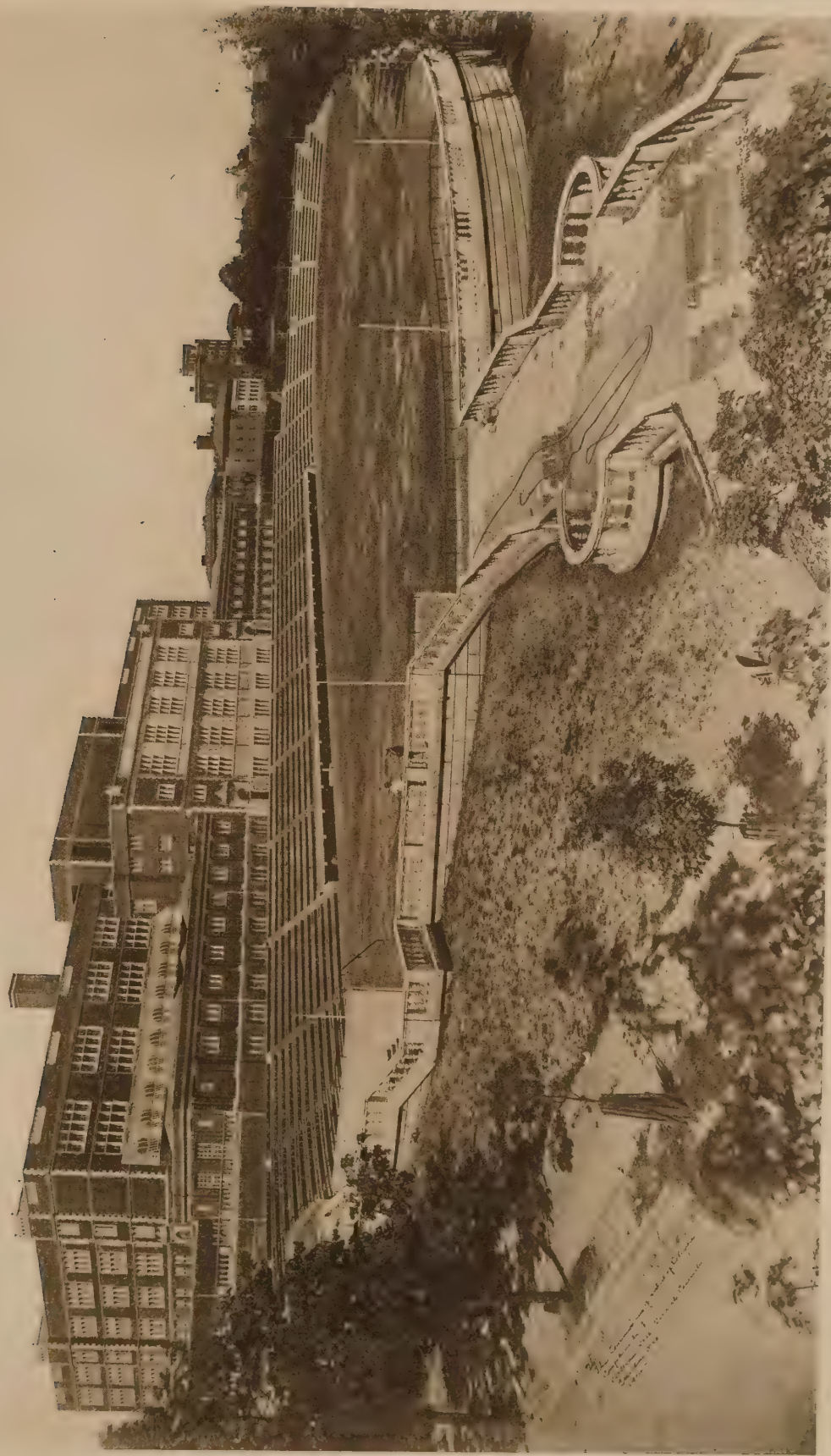


FIRST FLOOR PLAN.

DESIGN FOR SCHOOL, CRANFORD, N. J.

A TWENTY-ROOM SCHOOL.

Hollingsworth & Bragdon, Architects.



CENTRAL HIGH SCHOOL, WASHINGTON, D. C.

Wm. B. Ittner, Architect.

Washington's School Shortage

THAT shortage of public school buildings in Washington has resulted in overcrowded classrooms and abbreviated courses of study for hundreds of children, is regarded by members of the education group of the City Club

as one of the most serious situations in Washington, and demands the immediate attention of the community.

As a result of action taken at a recent meeting, the group will give thorough consideration to all plans for relieving the shortage of classroom facilities. A member of the board of education has been invited to be present at the next meeting and submit such plans as the school governing body may have formulated for remedying the situa-

tion. Definite action to aid in relieving conditions will then be taken by the group.

There was an informal discussion of some of the methods that emergency relief funds for financing a school-building programme could be obtained. Use of the District government surplus revenues, amounting to approximately \$4,300,000, was suggested.

It was pointed out that the District's surplus funds have accumulated since 1916, when the revenues received under the half-and-half system of taxation were larger than required.

If Congress is asked by the City Club to allow school authorities to use these revenues for the erection of much-needed buildings, a request also will be made to have the federal government add about \$4,300,000 to the District's fund. It was made clear that this will only be fair, due to the fact that the surplus revenues accumulated under the half-and-half system of taxation, and that the federal government should add its share to the municipal government's money. This would make approximately \$8,600,000 available for the school building fund.

Enrolment records in the District public day schools have been broken. Figures compiled by officials show that 60,820 children are registered in the schools to-day, or 1,885 more than last year. The maximum enrolment last year reached about 60,000, making the enrolment to-day an increase of 820 over the peak of last year.

The total enrolment in both day and night schools, the figures show, has reached 66,868, an increase of 447 over the early October registration of last year. Pupils registered in both day and night schools last year at this time totalled 66,421.

Two hundred and twenty-seven students are enrolled in the normal schools.

The high school registration has reached 9,070, against 8,540 last year.

Enrolments in elementary school divisions total 51,186. This is an increase of 980 in the graded school enrolment this year.

In the night schools 6,048 are enrolled, an increase of 41 this year. Of this number 1,914 are colored and 4,134 white.



Entrance, Dunbar High School, Washington, D. C.
Snowden Ashford, Municipal Architect.



Central High School, Washington, D. C.

Wm. B. Ittner, Architect.

The Ridgewood High School

By Egerton Swartwout

THE almost invariable mental picture of a high school is a square block of a building filled with large windows and with occasional blank spaces where there are no windows. It is ornamented, Heaven help it, with pilasters and a heavy cornice, or more often it is in a style of architecture which the local authorities call Tudor. It may be, and often is, practical enough, and has unilateral lighting and all the latest school equipment, but architecturally it is a crime, and being fireproof, it successfully resists the efforts of a beneficent Providence and remains, until happily it is outgrown and turned into a garage. Of course there are occasions where the exigencies of the site and the requirements of the locality demand a square block of a building, but more often than not it is merely due to lack of imagination on the part of those in charge of the work. It is always possible to get an interesting solution to any school problem. Mr. Clipston Sturgis has done a great deal for the schools around Boston, and there has been some charming work done in the Far West. There are some schools in California which are remarkably good and show an extremely ingenious treatment of the fenestration.

In the case of the Ridgewood high school a square-box plan would have been absolutely incongruous. The site is good; one of the best I have ever seen. It is in a fine residential section of the town, on a main thoroughfare, and is about eight acres in extent. The western half is flat meadow-land, bordered by a pleasant little stream, and forms an ideal athletic field. Toward the east the ground rises about thirty or forty feet and is very well wooded; the slope of the hill is gradual and curves toward the southeast. It is obvious that the gymnasium should be in close proximity to the field, while the auditorium, which was to be used for public gatherings not necessarily connected with school work, should be convenient of access to the main street. The usual arrangement of a combined gymnasium and

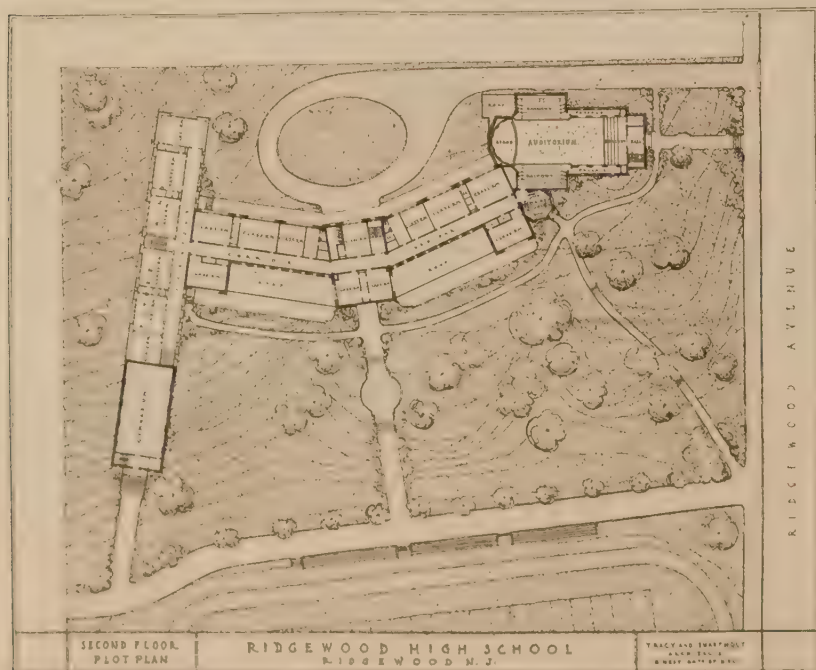


auditorium, or a gymnasium under the auditorium, was therefore impossible. The gymnasium was accordingly placed at the foot of the slope adjoining the field, and directly connected, though at a lower level, with a future extension of the school proper. The auditorium, which with its

future galleries will seat about one thousand, was placed at the other end of the building, facing the main road, and on the axis of an intersecting street. This arrangement is not so economical of cubage as the more compact plan perhaps, but its obvious advantages more than offset its slightly increased cost. Each unit is where it should be, and both can be used simultaneously without interfering with each other, and each can be used in the evenings without the necessity of opening or heating the school proper, which is the connecting-link between these two units and is irregular in plan, with a high central pavilion and two wings forming an obtuse angle with the central portion. By this irregularity of outline the building follows the contour of the hill and preserves the trees, most of which are large, fine specimens.

The building is extremely simple in character and almost devoid of detail. Simplicity is always desirable in a school, but in this case it was an essential, as the construction was started just before the war, in the face of a rising market.

The walls are a good quality of com-



mon brick and the trimmings cast stone. The roof is slate. An effort has been made to avoid the factory-like appearance of the recurrent groups of large windows, and to give the building a more academic or institutional air than is usual. This is accomplished by recessing the front above the first-story level, so that on the second and third floors the classrooms are on the rear, and the front windows on these two floors merely serve to light the corridors. The rear is not visible from the street, so that the large glass area faces nearly north and is entirely unobjectionable.

The auditorium is quite a radical departure from the ordinary bare, flat-ceilinged room. It is cruciform in shape and finished with brick quoins and rough plaster work, left in the brown or, rather, scratch coat, and is unpainted. The few mouldings on the ceiling are run in this same scratch-coat mortar. The plasterer insisted it could not be done, but it was finally, and the effect is remarkably good. The mouldings are naturally rough and imperfect but they harmonize with the ceiling, much more in reality than would appear from the photographs. In connection with this finish I stumbled on an acoustical effect which as far as I can find out has never been noticed before. In the original

contract we had provided a certain amount of acoustical felt on the side-walls and on the vault over the stage. This was cut out to reduce the expense, and I was only fearful as to the result. Much to my surprise, I found on the opening night that the acoustics were excellent. After some experiments I came to the conclusion that it was on account of the thinness and porosity of the plaster on the ceiling. This is, as I have said, one coat of scratch on wire lath, and in some cases the coat was so thin that from the scaffold you could see the light from the skylight through the small interstices of the plaster. Undoubtedly the sound-waves went through the plaster, and the effect was almost as good as if the whole ceiling had been covered with felt. I don't pretend to say this would happen in every case, but it did at Ridgewood, and I have so much confidence in the idea that I am using this same scheme for a church. It's worth trying, anyway. The auditorium in the future will have two side and one rear galleries, which will increase its seating capacity and improve its appearance. Eventually I suppose the plaster will be painted, as it has gotten badly discolored in places, but the general color of it is excellent as it is.

A Notable One-Story Schoolhouse

The Rosemont School, Radnor Township, Pa.

By David Knickerbacker Boyd

THE new grammar-school completed in the summer of 1915 at Garrett Hill, Rosemont, Pa., marks an epoch in suburban-school development in Pennsylvania. Placed in a rapidly developing section of suburban character, this building has been designed on the unit principle so as to meet most readily the needs for increased educational facilities which will arise from time to time. To best accomplish this purpose, the one-story unit type was decided upon by the school board of the township of Radnor, after a thorough study had been made by the architects, Messrs. D. Knickerbacker Boyd, John L. Coneys, and Victor D. Abel. This type of building is arranged so that one classroom may be added at a time, if desired, or larger units may be constructed. The building is of the most flexible possible type, and is capable of indefinite expansion.

The portions of the new building now in use contain four classrooms, a well-lighted manual-training room, a domestic-science room, and play-rooms. There are also service-rooms in the shape of toilets, storerooms, and retiring-rooms for the teachers. A feature of the plan which deserves especial attention is the wide, well-lighted corridor, which has been designed not only as a means of circulation between classes and exits but which is intended for use in the summer-time for open-air classes and for other general school activities.

The physical activities of the school have been especially provided for in the basement. A shower-room, special toilets, and a tub-bath have been provided for the use of the pupils who will engage in athletics. A special entrance has been arranged so that the baths may be entered directly from the athletic field. It is proposed to use the field for community purposes, and a separate entrance will make possible the use of the basement for dressing-rooms without opening the balance of the building.

The features of the building just described have been provided for the double purpose of affording the broadest educational opportunities to the children, and also for making the school a recreation and social centre. The school

board has been far-sighted in purchasing a large tract of ground, so that several acres are devoted to play purposes. These will be open for the general community at special times to be arranged by the school board.

While flexibility for future extension was the deciding factor in favor of the one-story type, many other considerations prompted its adoption.

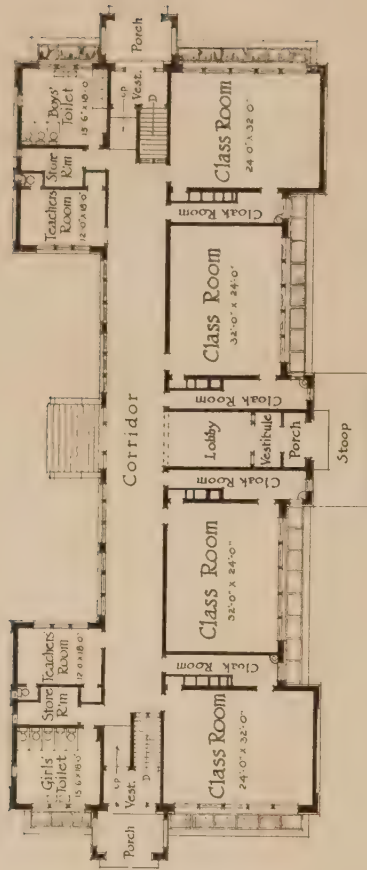
The first consideration was naturally the safety to life and limb, which is insured by having all classrooms and toilets on the ground floor, with a separate exit for each classroom. A glance at the illustrations will show how completely the menace of fire and panic has been removed.

With but one story, there are no stairs to climb several times a day, as is the case when some classrooms are on the second story. From an administrative standpoint, and in the dismissal of classes, etc., the one-story form of structure is admitted to be vastly superior to the two-story building. All interior walls and partitions are of brick and hollow-tile construction. Even the outside walls are lined with the latter material, doing away entirely with wood-lath or wood in the building, except in the roof itself, below which are suspended metal-constructed ceilings.

Individual bubbling fountains with wash-basins have been placed in the cloak-room connected with each classroom, and fire-hose equipment has been fully installed as a precautionary measure. The building is heated and ventilated by warmed fresh air, aided by direct steam.

The materials for construction are, aside from the fire-proof floors and walls described, Holmesburg granite base, with brick above to the cornice, above which rises a green slate roof. The windows are disposed along the one side of each classroom, providing "unilateral" light.

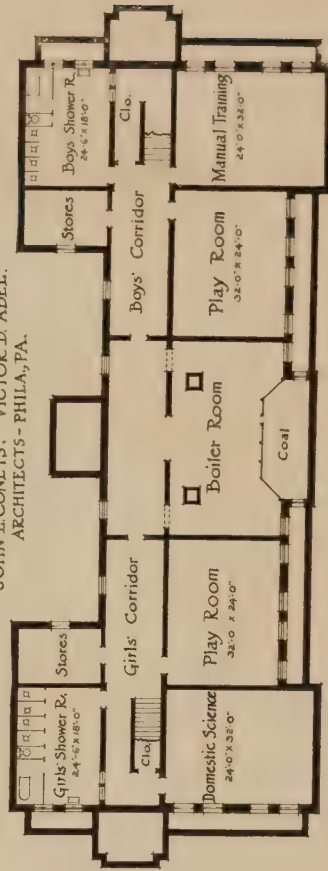
The corridors and toilets have red blocked cement floors with metal baseboards. The entire building is fitted with a vacuum-cleaning outfit; it is brilliantly illuminated and fitted with all devices to make it a model from the standpoint of health and hygiene, and to make it a community centre as well as an educational centre.



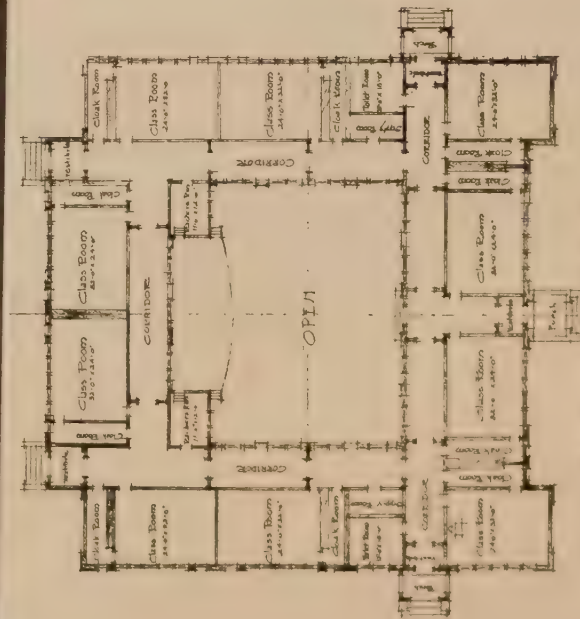
First Floor Plan

GRAMMAR SCHOOL BUILDING
for the
SCHOOL DISTRICT OF THE TOWNSHIP OF RADNOR
ROSEMONT-PENNA

D. KNICKERBACKER BOYD FAIA.
JOHN L. CONEYS, VICTOR D. ABEL.
ARCHITECTS - PHILA., PA.



Basement Floor Plan



First floor plan for future enlargement.

The accompanying illustrations show two possible plans for the development of the building. In each the ultimate structure will be in the form of a hollow square, on the inner side of which will be continuous lighted corridors. These corridors will resemble a cloister in every detail except for the enclosing eash. The court may even be left open so as to form an open-air playground or open-air auditorium. It may also be roofed over for assembly and auditorium purposes.

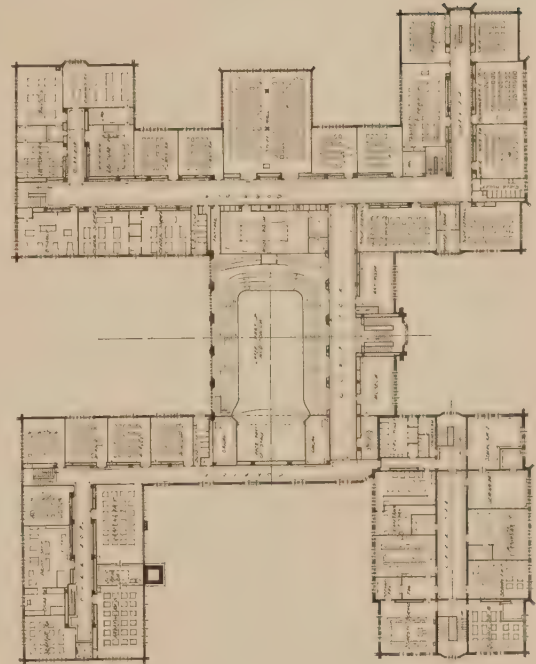
The Sheboygan High School

Childs & Smith, Architects

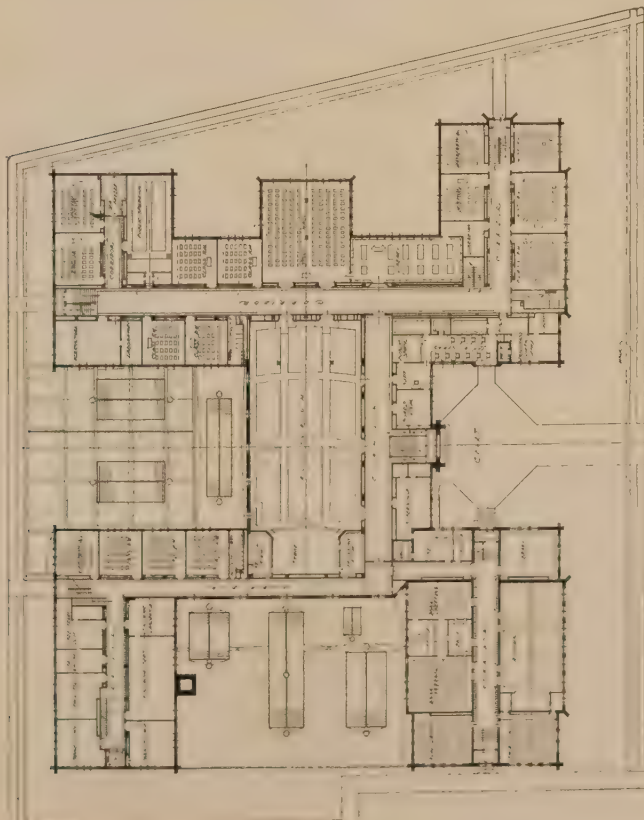
SOME of the finest recent school architecture in the country may be seen in the Middle and Far Western States. There has been keen rivalry among the local school boards there to get away from the old-time uninteresting and conventional schoolhouse, and to provide something that shall be both a source of local pride and an object-lesson to the community and the pupils.

In the Sheboygan high school, which involved a plan of large scope adapted to a building of unusual dimensions, a most happy result has been obtained. The building has dignity and architectural character with the appeal and charm of some of the notable examples of collegiate Gothic identified with the great universities. Ample provision for the requirements of study have been considered and the vital problems of abundant light and air. Here is a school that will remind many of the great public schools of England, of the great universities of England even, and of some of the famous buildings identified with our own colleges, both East and West. Such a building should be something more to the community than just a fine schoolhouse. It should be a lesson in the traditions that the architects have so admirably embodied in their design. The architects have succeeded admirably in adapting Gothic elements to a thoroughly up-to-date modern school, complete in all its manifold appointments.

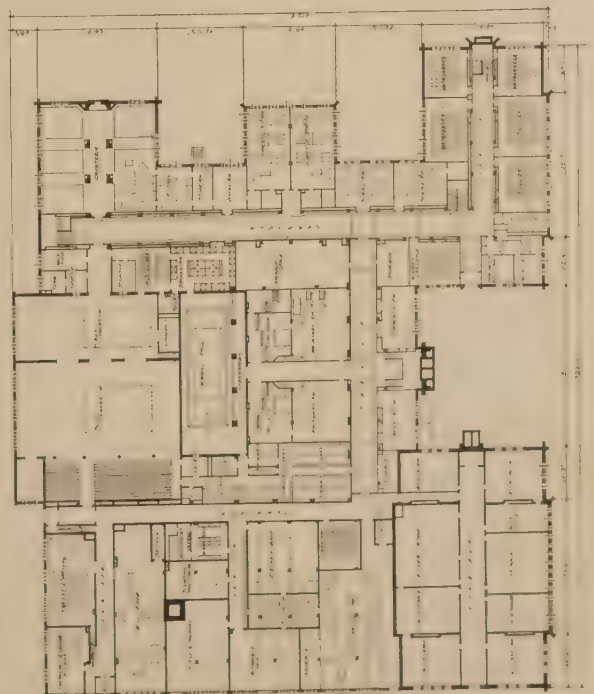
No public buildings have a greater educational value in the teaching of appreciation of architecture than our schools, for they make an appeal to minds in their formative and impressionable period. Sheboygan may well be proud of this handsome and distinguished building.



Third-floor plan.



Second-floor plan.



First-floor plan.

The Freer Gallery and What It Will Contain

NOTE.—Although the building is completed, it will not be opened to the public until the collection is completely in place; probably some time next fall.

Charles A. Platt, Architect

THE building for the Freer Gallery, founded by the late Charles L. Freer and presented by him to the nation, has been in course of construction for several years. It is now practically completed, and when the process of installing the objects of art destined for it has been carried through it is probable that the structure will be dedicated before an-

other year is finished. The Freer Gallery is situated on the south side of the Mall, not far from Washington Monument. It is one of the buildings entering into the grandiose scheme

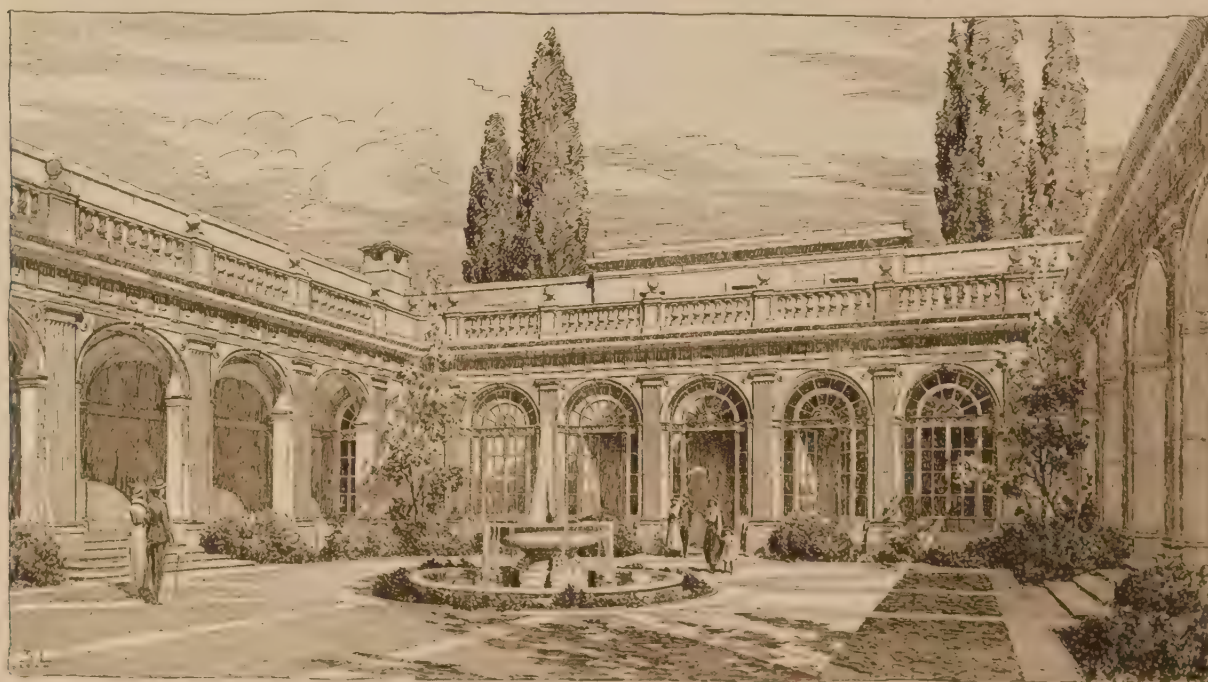
planned for the beautifying of the city and stretching from the Capitol down to the Lincoln Memorial on the banks of the Potomac.

The property on which the Freer Gallery stands belongs to the Smithsonian Institution, whose own old building at present occupies the neighboring site but is expected ulti-



other year is finished. The Freer Gallery is situated on the south side of the Mall, not far from Washington Monument. It is one of the buildings entering into the grandiose scheme

mately to be taken down. The gallery has been built out of the fund provided for the purpose by Mr. Freer. It will have cost, when the last detail has been attended to, approxi-



mately \$1,500,000. It will be under the administration of the Smithsonian Institution. The regents of that institution will appoint the curator, whose name has not yet been announced.

The drawings, prepared by Mr. Platt, show a building in the style of the Italian Renaissance, a building which, as befits its purpose and the nature of its environment, is of modest height. It is 228 feet long and 185 feet deep, with and interior court open to the sky. This court is some 60 odd feet square, exclusive of the loggias which surround it. The exterior building is constructed of a warm, gray granite coming from Milford, Massachusetts. The court is of Tennessee marble. The floors of the galleries and corridors throughout the main floor, on which the works of art will be exhibited, are entirely of marble and tarazzo. Everything, of course, is absolutely fireproof. As the dimensions already given plainly show, the building is spacious. There are eighteen rooms surrounding the court on the exhibition floor. In the basement, in addition to the necessary administrative quarters, there is a commodious lecture-hall, and there are a number of storage-rooms. There are also rooms set apart for study. It is quite impossible and would be, in fact, opposed to Mr. Freer's ideas to exhibit all the gallery's possessions at one time. Quantities of these will be kept stored, but whenever a serious student with proper credentials wishes to examine them they will be brought out for his convenience and placed in the study-rooms aforesaid. The lecture-hall, by the way, has an entrance of its own at the rear of the building, which will obviate the necessity of bringing all the members of an audience through the exhibition-rooms.

The lighting of the main floor is entirely by skylights. Owing to the fact that the collections consist largely of small objects, the galleries are not lofty and the exhibition space on the walls is kept as low as possible. Each exhibition-room has its individual skylight. This may be tempered by louvers above the diffusing glass, so as to suit the requirements of the objects shown. None of the exhibition-rooms is at all wide. This is the result of a careful study of the matter of lighting. It recognizes the fact that for light to fall at the proper angle the distance from the skylight to the object displayed must not be too great. The question of temperature has also been taken into very serious consideration. The Freer collections contain many Oriental objects, which would be injured by too dry an atmosphere. Arrangements, therefore, have been made whereby moisture may be introduced whenever the air becomes too dry. There is a constant circulation of air provided above the diffusing glass in every gallery. This is expected to keep down the temperature in hot weather and has been calculated with particular care in view of the climate prevailing in Washington.

The principal entrance to the Freer Gallery will be through a loggia and vestibule opening upon a large square hall, in which there will be coat-rooms to the right and left. Turning to the right along the corridor, which divides this hall from the open-air court, the visitor will find four rooms devoted to paintings by American artists. One will be given entirely to the works of Thomas W. Dewing, another to those of Dwight W. Tryon, and a third to pictures by Abbott H. Thayer. The fourth room in the group will be given to a miscellaneous collection of American art, including paintings by the late John H. Twachtman, John S. Sargent, Willard L. Metcalf, J. Francis Murphy, Winslow Homer, and Charles A. Platt. The galleries on the farther side of the building will be occupied wholly by the works of Whistler. They terminate in a space in which the famous Pea-

cock Room has been erected, precisely as it existed in the house of Mr. Leyland in London, for whom Jekyll, the architect, originally constructed it and where Whistler gave it the decoration which has made it renowned. All the other galleries on the exhibition floor are devoted to the works of Oriental art that form a distinctive feature of the Freer gift. These Oriental rooms will, of course, be kept comfortably filled, but there will always remain, as has been

BUILDING FOR THE FREER COLLECTIONS

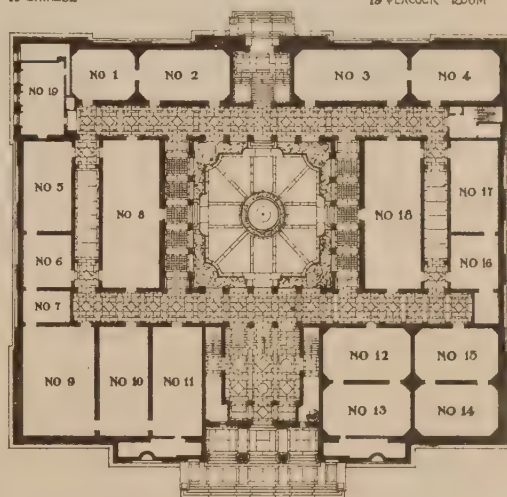
WASHINGTON D. C.

CHARLES A. PLATT
ARCHITECT
101 PARK AVE. NEW YORK

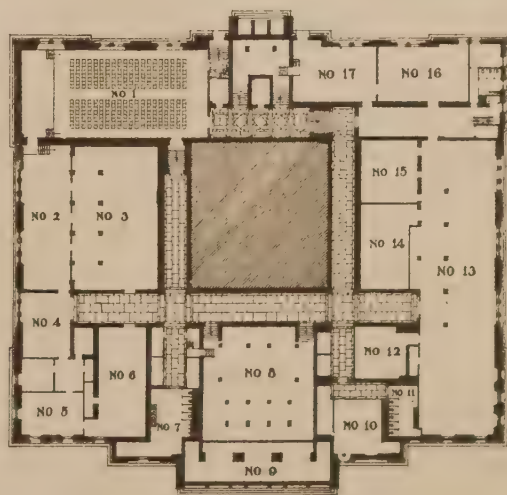
SCALE 1" = 10'

- 1 WHISTLER
- 2 WHISTLER
- 3 WHISTLER
- 4 WHISTLER
- 5 CHINESE
- 6 CHINESE
- 7 CHINESE
- 8 CHINESE PAINTINGS
- 9 CHINESE SCULPTURE
- 10 CHINESE

- 11 PERSIAN & EGYPTIAN
- 12 AMERICAN PAINTINGS
- 13 AMERICAN PAINTINGS
- 14 AMERICAN PAINTINGS
- 15 AMERICAN PAINTINGS
- 16 JAPANESE POTTERY
- 17 JAPANESE PANELS & KAKEMONOS
- 18 JAPANESE SCREENS
- 19 PEACOCK ROOM



FIRST FLOOR PLAN



BASEMENT PLAN

- 1 LECTURE HALL
- 2 STUDY ROOM #1
- 3 GENERAL STORAGE
- 4 ANTE ROOM
- 5 CURATOR'S ROOM
- 6 STORAGE ROOM #1
- 7 MEN'S TOILET
- 8 PAN ROOM
- 9 AIR CHAMBER

SCALE 1" = 10'

- 10 LADIES ROOM
- 11 LADIES TOILET
- 12 STORAGE ROOM #2
- 13 STUDY ROOM #2
- 14 STORAGE ROOM #3
- 15 STORAGE ROOM #4
- 16 WORK SHOP
- 17 RECEIVING ROOM

said, a great number of objects in the storage-rooms. These will be drawn upon at regular intervals to make changes in the exhibition-rooms, so that the gallery from month to month will have always something new to attract the student.

In order to give some idea of the character of the collections taken together, Mr. Platt has supplied the following data:

AMERICAN ART

By James McNeill Whistler:

60 oil-paintings.
35 pastels.
45 water-colors.
100 drawings and sketches.
700 etchings and lithographs.

The Peacock Room.

By Dewing, Thayer, Tryon, etc.:

85 oil-paintings.
6 water-colors.
45 pastels.

By Augustus Saint-Gaudens:

2 studies cast in bronze, originally projected for the entrance to the Boston Public Library.

ORIENTAL ART: FROM THE FAR AND NEAR EAST

Something over 1,000 Chinese paintings.

About 135 Japanese screens.

" 400 Japanese paintings.
" 35 Chinese tapestries.
" 700 Chinese, Japanese, and Korean bronzes.
" 100 additional metal objects.
" 160 Chinese stone sculptures.
" 350 Chinese jades.
" 400 pieces Chinese pottery.
" 750 pieces Japanese pottery.
" 225 pieces Korean pottery.
" 375 pieces Near Eastern and Egyptian pottery.

A collection of several hundred pieces of Egyptian glass.

Town Planning for Convenience and Health

By Louis Lott

PART II

THE chart on page 336 shows the subdivisions of a comprehensive plan and the "maxims" that must guide the planner and the community in its preparation, and also the sources from which the funds for actual execution can be secured, by which, the grit, enthusiasm, esprit de corps, and liberality of a community can be measured.

The subdivisions of the plan are largely technical, but are more or less self-evident. To begin with, there must be statistics upon which a proper analysis of the case for planning can be made. Next are the plans of a general nature, empowering legislation, and—that which is very important—education of the public upon this vast subject through articles in the local papers, through illustrated lectures before clubs, and, as a permanent part of the curriculum of high schools, illustrated lectures upon the principles of town planning and of good citizenship, which are seeds planted that in time will bear the fruit of moral and active support for this great question.

The detail plans exhaust the subjects under each heading and with due regard to each other. The guiding maxims for the preparation of the plan are as follows:

"Local and national patriotism" of its citizenship is the biggest asset that a community can have when attacking such a proposition. This will enable one community to outdistance another that has greater wealth and resources, but which has not the spirit of solidarity and sacrifice, nor that sense of greater civic responsibility that will prompt its citizens to give of their surplus wealth in the form of donations and bequests to this splendid cause and that will furthermore prompt them to subordinate personal opinion and interests for the good of the greatest number and stifle such "petty sentimentality" as is often displayed for the retention of this or that building or idea that would be in the way of genuine progress; all of which can be brought about through education upon the subject.

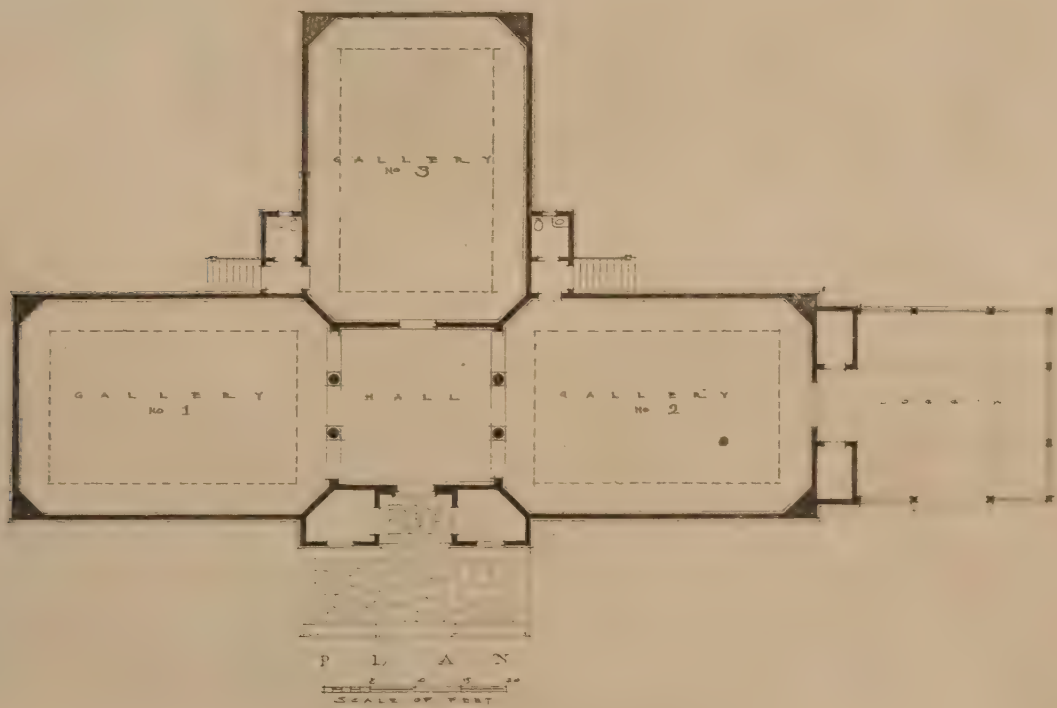
The first "maxim" that must guide the preparation of the plans is "reasonableness." The idea to be worked out must come within the bounds of reason and must ultimately be possible of execution. Mere castles in the air will scuttle the whole plan. However, that does not mean that the operations to be undertaken upon the physical body of the community should consist in mincing little scratches and cuts. On the contrary, the diagnosis and remedies must be sure to go to the root of the matter even if the actual operations must be deferred for a number of years. What, after all, does such a length of time mean in the life of a community, especially when it is considered that the infirmities of the city plan date in many instances from the beginning of the community? Make no little plans but such as are within the bounds of reason and common sense, and that can be executed wholly or in part from year to year.

An orderly development plan is also, among other things, purely a "business proposition," and must be founded upon the sound economic basis of cutting down overhead expenses, avoidance of waste, and securing permanent improvements to the community, for no undertaking or business is founded upon a sound financial basis that does not spend money in order to conduct its business in the most efficient manner and to achieve ultimate economy, and if this is conceded as true then few of our cities are now being developed upon this economically sound principle.

"Practicability" is the first requirement of a city-plan project, and this must be considered in advance of economy or beauty, since a thing cannot be considered economical in a larger sense if it is not practical, nor beautiful if its beauty is marred by the fact that it is impractical, does not fulfil its function, and consequently is an economic failure. Too much petty, short-sighted, makeshift economy is practised in city improvements that, in the end, prove wasteful.



F R O N T E L E V A T I O N



L Y M E A R T G A L L E R Y

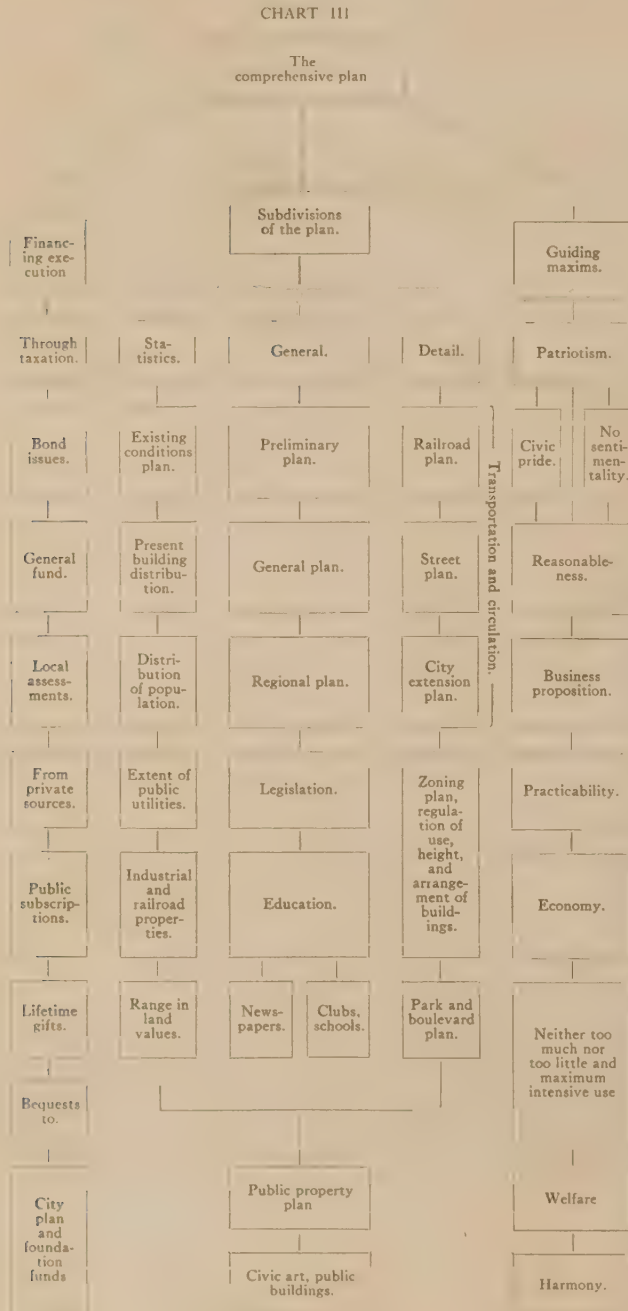
*Charles A. Platt, Architect
101 Park Ave. New York City*

Therefore "constructive economy," in the sense of "neither too much nor too little," that permits neither narrow niggardliness nor extravagance of any kind, must be a basic maxim in community development, since in all communities the programme of the comprehensive plan will be so large and the coast so great that no community can hope to carry it out excepting upon the basis of this maxim. Furthermore,

burban street, etc. Such a policy will go a long way toward conservation of community resources and will make many an essential or desirable improvement of the city plan possible.

The "welfare" features of a community must also receive basic consideration in the comprehensive plan by providing facilities for the proper kind of wholesome recreation, amusement, social intercourse, and broadening education. With such maxims to guide the preparation of the plan, it cannot help but be a complete success if "harmony of looks," which is just another expression for "beauty," is also admitted to the partnership of guiding maxims.

Heretofore it has been the right of an owner of a piece of property to carry on any kind of an activity or to erect any kind of a building upon it, excepting for such restrictions as might be contained in his deed, or any extreme nuisance that might be attacked in court. This custom has



in order to make every dollar count to the utmost, the maxim of "maximum intensive use" should be applied to everything in which public funds as well as private capital are invested, from the rarely used spare bedroom and the unnecessarily large porch of the private residence to the church property that lies idle at least 80 per cent of the time, to the average duplication of 30 per cent of street-car trackage, and the excessively wide roadway of the purely local su-



Dayton, Ohio. A lost opportunity.

produced a hodgepodge of development in our American cities that has resulted in enormous losses, shiftings, and unstabilizing of realty values. This was particularly true of New York City, where conditions had become so acute and



Alley housing, Dayton, Ohio.

realty values so unstable that something had to be done that would curb this and that would regulate development in the future. Accordingly, the New York zoning law was framed and passed by the legislature in 1916. Since then many States, following the example of New York, have passed similar laws that have enabled many of their progressive communities to prepare zoning plans and regulations

to govern their future development, and thereby safeguard and stabilize their realty investments.

Zoning means that a community is divided into a number of districts or zones, each of which is governed by special regulations that control the height, use, and arrangement of the buildings within that zone. These different zones are largely established in accordance with existing conditions, but their restrictions are not retroactive. The regulations that limit the height of the buildings are determined according to their use and the widths of the street upon which they face, thereby assuring an adequate amount of light and air, whereby such examples of short-

sightedness as were shown in the erection of the Wall Street office-building cited later on are avoided. Some communities that have a zoning plan have created many more zones than are shown upon this chart; others have deemed it wise and more expedient to have less, especially as regards residence zones, but in view of the fact that activities that do not belong in such districts are constantly encroaching upon residence property with the resultant losses in values, the zoning regulations applied to

pital zones; stores, etc., are only allowed to be established on the main traffic streets where they naturally belong. Residence districts are here divided into multiple-family, apartment-house, and detached-residence zones; the first allows double, duplex, and row houses; the second may contain any of the three groups but would eventually contain practically all apartment-houses. In some cities, where the apartment-house is quite frequent or the rule, it will be necessary to create A, B, etc., groups, which are then based upon the number of families allowed per acre. Single-family-house zones are reserved for such only, and are here divided into three groups—A, B, and C—based upon space limitations. The subdivision under residence will vary in different communities.

This subject is vast and only a general idea can be ob-



Dayton, Ohio. Contractor housing—not enough space.

Residence districts should be strict. A man's home, above all, should be protected.

The zones shown in Chart IV are as follows: Objectionable Industries, Unrestricted, Industrial, Commercial, and Residence districts.



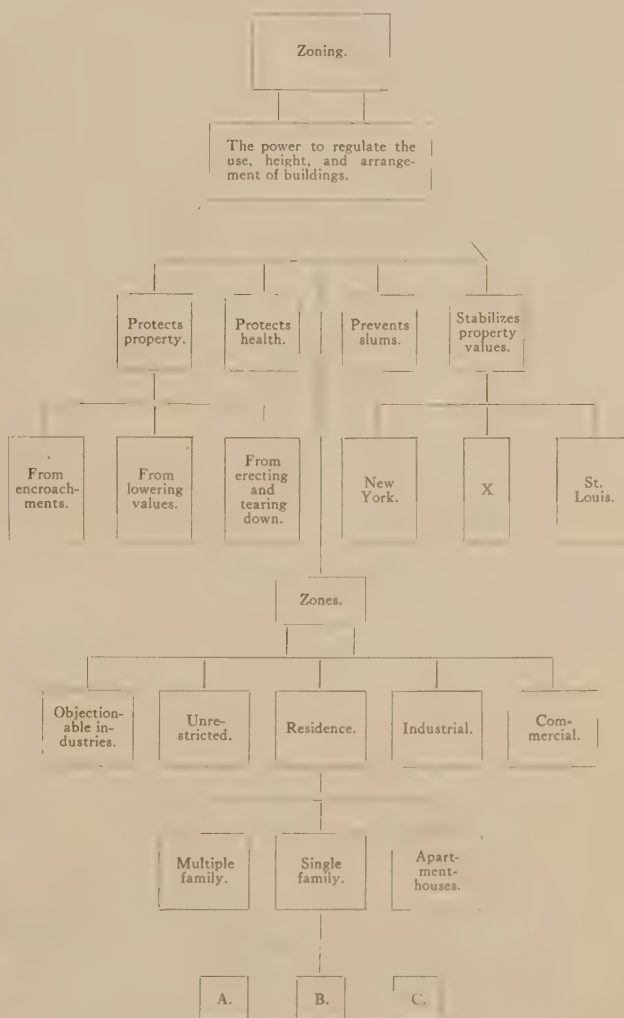
General new contractor type (bad), Philadelphia, Pa.

By establishing these various zones nuisance industries are restricted to Objectionable Industries zones, and are kept out of Industrial zones. Factories, junk-yards, etc., are kept out of Commercial zones; activities that cause noise or much traffic are kept away from school and hos-

pital zones; stores, etc., are only allowed to be established on the main traffic streets where they naturally belong. Residence districts are here divided into multiple-family, apartment-house, and detached-residence zones; the first allows double, duplex, and row houses; the second may contain any of the three groups but would eventually contain practically all apartment-houses. In some cities, where the apartment-house is quite frequent or the rule, it will be necessary to create A, B, etc., groups, which are then based upon the number of families allowed per acre. Single-family-house zones are reserved for such only, and are here divided into three groups—A, B, and C—based upon space limitations. The subdivision under residence will vary in different communities.

This subject is vast and only a general idea can be ob-

CHART IV



tained from such an article as this; however, a few examples are here cited for better understanding. Again New York furnishes some very extraordinary examples of the value of zoning, which, however, apply in principle to small communities as well. Somewhat prior to the period of 1916 land values upon the south side of 23d Street between Fifth and Sixth Avenues and upon Sixth Avenue between 14th and 23d Streets were at least double what they are to-day. This great slump was chiefly caused by the moving away of the great department-stores from this neigh-

borhood, because of the encroaching industries that supplied these stores. However, after the stores had moved up to 34th Street and Fifth Avenue and on up the avenue to 42d Street, the cloak, suit, etc., manufacturers followed them from their locations in the side streets off of Fifth Avenue below 23d Street up into similar locations between 35th and 39th Streets. At the noon and evening hours these shops dumped their workers, mostly foreigners, out upon Fifth Avenue when it was crowded with shoppers, blocking the sidewalks and driving the shoppers away. An



War housing, Erie, Pa.

emphatic protest from the merchants of the avenue, accompanied with a threat of boycott of these manufacturers, together with the new zoning ordinance, which assigned other locations for these shops, eventually put an end to this, and is restoring the avenue to its normal life.

Another instance, and not an isolated one by any means: In Wall Street one of the early tall buildings, like many others, secured much of its light from windows in a party wall. In other words, it was stealing its neighbor's light until the owner of the latter also erected a tall building and shut off the source from his side. Naturally this caused vacancies. Just prior to 1916 this building, which represented an investment of about \$2,000,000, was operating at an annual loss in excess of \$30,000, and in 1916, when there was a great demand for office space, the owners of the build-

ing considered themselves lucky that the income showed a balance over expenses of about \$5,000, or about $\frac{1}{4}$ of 1 per cent upon the capital invested. The new zoning law has put an end to the possibility of such losses to the individual by protecting him from his own greed and short-sightedness, and thereby the community from loss of resources and collectable taxes.

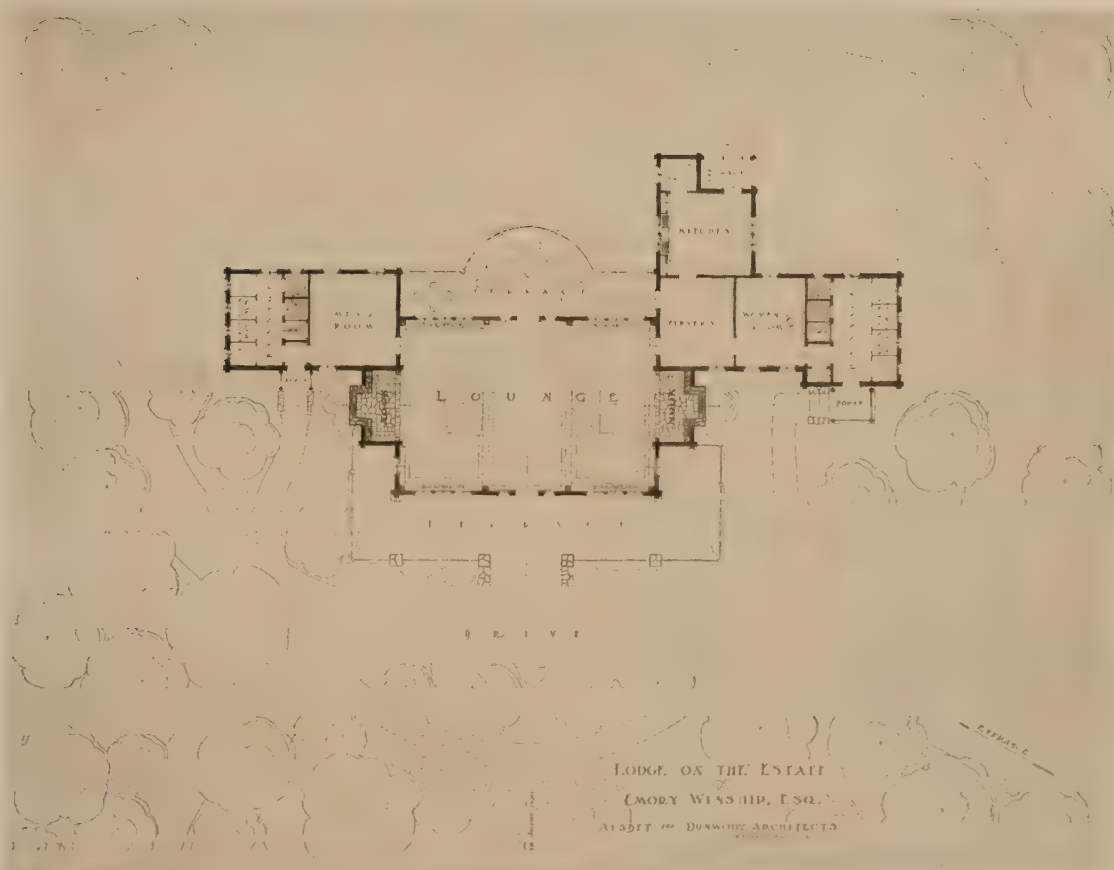
Many pages could be written citing parallel cases in New York, and similar cases exist in every community in the country. The only difference is in the size of the figures. For instance, in the Middle West, in a small town of about ten thousand inhabitants, a lumber warehouse was erected in recent years in the heart of a natural residential district, not more than five blocks from the centre of town, and in order to emphasize its presence it was painted a bright orange. True, there were not many houses in the neighborhood at the time, but it has now become thickly settled. Naturally these properties will depreciate in value, especially since a modern subdivision is being opened up near by. Besides, there is the ever-present menace of an enormous conflagration should this warehouse ever catch fire. This shows that not only large cities are in need of zoning, but that smaller communities need this as much if not more, in order to regulate their growth and prevent losses which they can ill afford, since their wealth is mostly very limited.

Another case: in St. Louis there is a blighted district of about fifty city blocks between the down-town business district and the residence district to the west that has suffered a great decline in property values, because of the westward growth. The properties in this district, largely residences, were retained upon the tax duplicate at very nearly their original values, whereas their income has been continually receding. This condition could well have been avoided to a large extent had St. Louis had a vision of its development, a comprehensive plan, and a zoning ordinance thirty years ago. The transition would then have been gradual, the development along orderly lines, and millions in wealth could have been saved to property-owners and to the community. It should be mentioned, however, that St. Louis is one of the few cities that now has a definite plan, which has the support of the public, and upon the basis of which improvements are proceeding right along.

(To be concluded.)



Entrance, Evander Childs High School, New York.



Construction of the Small House

By H. Vandervoort Walsh

Instructor in Architecture, School of Architecture of Columbia University

ARTICLE III

ESSENTIAL STANDARDS OF QUALITY IN BUILDING MATERIALS

MATERIALS USED

FROM the last article it will be remembered that the commonest types of small houses are the wooden-frame house and the masonry-and-wood house. Now it is essential that certain definite qualities be required of all materials of construction which enter into the building of these houses, and although there are many facts covering the standard qualities and methods of manufacture, yet the designer cannot expect to remember all of them. It is sufficient if he knows those qualities which mean satisfactory building and durability when applied to the structure.

Of the large number of materials which enter into the construction of a house, the following are the most important and should be maintained at a high standard: wood, clay products, cementing materials, metals, glass, and paint.

Woods

It is possible to enter into a long discussion of the classes, qualities, methods of conversion, defects of wood and similar subjects, but these are not pertinent to the main idea, namely, the essential qualities of woods which are used in the construction of the small house. There is a prevalent impression abroad that the supply of wood is becoming so depleted that it will in the future be used only for special ornamental features. This is wrong, for we still have enough virgin forests left to supply the country for several generations, and with the growth of forestry we will maintain a certain source of supply.

We have two classes of woods on the market which are used in different parts of the structure, according to their special qualities. These are commercially known as hard and soft woods, although this is not a very scientific distinction, since some of the soft woods are harder than some

of the hard woods, and vice versa. Scientists have more accurate names than these, but as the above are so well established, there is no doubt as to what is meant.

In the market, lumber is not only classified according to the above, but according to the species of tree it comes from, and also according to certain standard grades of the same kind. These grades are determined by the presence of certain defects. The recognized defects are knots, shakes, checks, splits, streaks, pitch-pockets, stain, rot, wane, warp, cupping, mineral streaks, pith on the face of the board, and worm-holes.

Various large lumber associations issue rules governing standard sizes and classifications for woods to be used in construction. The best and the next best are the usual grades which are used for the interior and exterior trim of houses. These grades have many designations, as "clears" and "selects," or "A" and "B," or "No. 1" and "No. 2," or "firsts" and "seconds."

The grades used for the rough framing, such as studs, joists, rafters, subfloors, and sheathing, are not so good. They are designated as "No. 1 common" and "No. 2 common." A poorer grade still, known as "No. 3 common," is sometimes used for cheap temporary structures.

For the details of grading and standard sizes of lumber, every architect should possess the publications of the following concerns:

Southern Pine Association, New Orleans, La.

West Coast Lumbermen's Associations, Seattle, Wash.

Hardwood Manufacturers' Association of the United States, Cincinnati, Ohio.

California Redwood Association, San Francisco, Cal.

Gum Lumber Manufacturers' Association, Memphis, Tenn.

The National Lumber Manufacturers' Association, Chicago, Ill.

Next to the grading of timber, the most important factor of quality is the relative durability of the various woods, for upon this depends to a large extent the choice of them for special places. The following is a table taken from a government classification:

RELATIVE DURABILITY OF THE COMMON WOODS

The Soft Woods

VERY DURABLE	DURABLE	INTERMEDIATE	NON-DURABLE
Northern white cedar.	Douglas fir.	Eastern hemlock.	True firs.
Western red cedar.	Tamarack.	Western hemlock.	Spruces.
Cypress.	Western larch.	Loblolly-pine.	
Redwood.	Long-leaf yellow pine.	Norway pine.	
	Eastern white pine.	Short-leaf yellow pine.	
		Sugar-pine.	
		Western white pine.	
		Western yellow pine.	

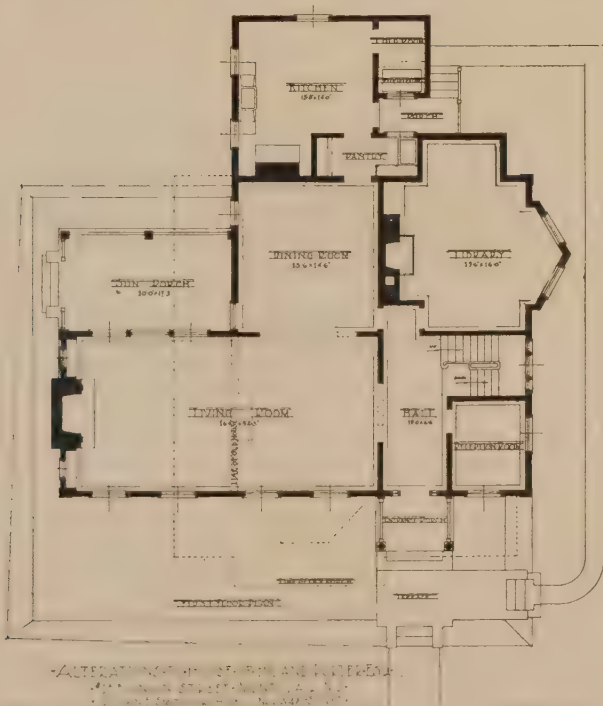
(Continued on page 342.)





ALTERATIONS, HOUSE, HILAND PORTER, MONTCLAIR, N. J.

Lucian E. Smith, Architect.



(Continued from page 340.)

Hard Woods

VERY DURABLE	DURABLE	INTERMEDIATE	NON-DURABLE
Chestnut. Black walnut. Black locust.	Cherry. White oak.	White ash. Butternut. Red gum. Yellow poplar. Red oak.	Basswood. Beech. Birch. Buckeye. Cottonwood. White elm. Hard maple. Soft maple. Sycamore. Cotton gum.

From this table it will be noticed that the soft woods as a class are relatively more durable than the hard woods. This is true, because of the fact that the structure of soft



Difference in the cut of flooring beams. The difference in the grain in the softer woods is not durable.

woods is simple, while that of the hard woods is complex. When the former becomes wet and expands and then dries out and shrinks, the structure is not stressed internally as much as is that of the hard woods, and they are therefore much more capable of withstanding the action of the weather. Also certain of the soft woods have natural properties of resisting dry or wet rot.

Certain species of woods are, therefore, selected for particular parts of the house according to the needs of durability, strength, appearance, and local supply.

Rough wooden framing requires a wood that is fairly abundant and strong. The soft woods are generally used, and those which are classified as durable in the table are the most used.

For rough underflooring and sheathing the cheapest and most abundant local wood is used. Durability is not essential.

For shingles the most durable woods must be used, such as cypress, cedar, and redwood.

Lath are generally cut from waste slabs, and should be of some soft wood like spruce or of one of the softer hard woods. Siding should be made from one of the soft woods, especially those which are classed as durable in the table.

Porch columns and the like require very durable woods. They should be hollow except for very small ones. Built-up columns of interlocking type are usually specified, but the lumber used should be thoroughly kiln-dried so that the joints will not open.

Flooring should be capable of resisting wear and should not splinter. The hard woods as a class are more adaptable than the soft woods, although yellow pine and Douglas fir are used a great deal on account of their cheapness. These latter are divided into two grades: "flat grain," in which the annual rings are almost parallel to the surface, and "edge grain," in which the annual rings run almost perpendicular to the surface. The latter is more desirable, since it wears better. The flat grain splinters off, due to the layers of soft spring wood and hard summer wood. Oak

flooring comes plain and quarter sawn, which is practically the same as the cut of yellow pine, but since oak is strong either way, the wearing qualities are not very different. Maple is also an excellent wood for flooring, since it is hard and smooth.

Door and window frames may be made from many kinds of wood, although the soft and more durable woods are generally accepted as the best. Specially hard and durable woods should be used for the sills.

Doors which are to be used on the exterior should be of a soft and durable wood. The choice of wood for interior doors is limited only by the taste of the designer. The doors which stand best the warping effect of steam-heat in the winter are constructed of white-pine cores with a veneer on the exterior made from some hard wood.

Sash and blinds require a soft and durable wood. Sash are subject to the drying of steam-heat on the interior and cold and dampness on the exterior. Sash built of yellow-pine sap-wood have rotted in a few years, and while soft maple, birch, and basswood have been used, they are not durable, although easily worked. White pine is considered to be the best for sash and blinds.

The selection of woods for interior trim depends only upon the designer's taste, since neither relative durability nor strength is a requirement. The harder woods in the past have been used more extensively for interior trim than the soft, because of their supposedly better and richer appearance, but this is not so true to-day, for new methods of treating such woods as cypress and yellow pine have shown them to be fitted for the best artistic places. Of course hard woods are not dented from knocks by furniture as easily as the soft woods, and in this way retain their appearance longer.

CLAY PRODUCTS

Bricks

In considering the essential qualities of bricks for the small house it must be appreciated that those bricks which are used on the exterior must be able to resist the effects of weather and produce the best artistic results, while those which are in the interior of walls or chimney need not be



Method of testing a sample brick to see whether it will have a tendency to white wash.

held up to such rigid standards. The determination of the resistance of bricks to frost and weather action is quite simple. A brick which struck by a hammer gives a clear ring is one which has been well burned and has no soft spots, cracks, or weak places. Such a brick can be said to be satisfactory for exterior use, provided that it has the proper form and color desired and is not so overburned as to be twisted and warped. Another requirement sometimes

specified is that the face brick made from soft clay should not show a percentage of absorption in excess of 15 per cent, and for the stiff-molded or dry-pressed bricks not more than 10 per cent. This, however, cannot be a hard-and-fast rule, due to the variation of clays.

Certain red bricks, unless they are burned very hard, show, when built into the wall, a very ugly white surface

Showing the use of metal lath in the joints of vertically webbed hollow tile, to prevent the dropping of the mortar into the voids and also allow the separation of mortar joint.



discoloration, called "whitewash" or efflorescence. This is not entirely due to the brick, since the mortar that is used may sometimes produce it. If it is due to the brick it can be discovered before the brick is used in the wall, by placing a sample brick on edge in a pan containing one inch of either rain or distilled water. As the water is absorbed by the brick, the white discoloration will develop on the top surface after several days of standing if it contains the salts which will cause the whitewash. Those bricks which have been very hard-burned will not discolor under any circum-

stances. If after passing this test the brick wall should develop whitewash, it can be laid to the mortar. In order to prevent any such occurrence it is necessary to waterproof the joints around window-sills and between the foundations and the wall, so that the minimum amount of water will be soaked up into the wall when it rains. An expensive addition of 2 per cent of barium carbonate to the mortar will tend to fix the soluble salts which cause this efflorescence.

Hollow Tiles

Hollow terra-cotta tiles used either alone and covered with stucco or brick veneer are being used more extensively than ever, due to the cheaper cost of laying them, since they are larger units, and also to the fact that they build a cellular wall. Wherever these tiles are used for bearing walls it is important that they be hard-burned, but the softer ones may be permitted in non-bearing partitions. Tiles for use in outer walls should be hard-burned, free from cracks, and straight, and should not show a greater absorption of water than 10 per cent. As these tiles are intended to support loads from floor-joists, it is essential that they should have the correct proportion of voids to solid shells and webs. The maximum width of any voids should not exceed 4 inches and the thickness of any shells or webs should not be less than 15 per cent of this measurement. In tests it has been shown that tiles laid with webs vertical are stronger than those with webs horizontal, but this difference in strength is not of very great importance in the small house, where the loads are very light. The chief thing to avoid in the setting of tile, when they are vertical webbed, is the dripping of mortar to the bottom and the insufficient spreading of it over the ends of the webs and shells. This can be overcome by laying wire lath over each course, and then buttering the mortar on the inside and outside edges. The mortar is prevented from falling out of place by the lath, and because it is not continuous through the wall, any penetration of moisture through it is stopped.

Mr. Leigh's Lithographs

THE frontispiece of this number is one of a series of notably distinguished lithographs by a young American artist, Howard Leigh, who has but lately returned from a year of study under Paul Maunier in Paris. Mr. Leigh's drawings include a number of views of old Paris and of famous buildings and scenes in the devastated regions, Rouen, Reims, Verdun, Soissons. The French Government bought a number of them. They will be shown this month at the Anderson Galleries, and we feel sure that architects and all interested in the graphic arts will find them well worth careful study.

Announcements

John M. Gardner and Richard O. Parry beg to announce that they have entered into partnership and opened an office for the practice of architecture under the firm name of Gardner & Parry, architects and engineers, 209-211 Guardian Trust Building, Denver, Colo., where they will be pleased to receive catalogues of various trades and manufacturing concerns.

We are in receipt of the new booklet showing the Gillis & Geoghegan hoists for handling material in industrial plants. It will be sent free upon request.

Harry Leslie Walker, architect, announces the removal of his offices from 19 West 44th Street to 144 East 54th Street, New York City.

Tilden & Register, architects, announce that on November 1, 1920, they will occupy new offices at 1525 Locust Street, Philadelphia, Pa.

The ILG Electric Ventilating Co., Chicago, announces the removal to their new and commodious building at 2850 North Crawford Avenue.

The company has had a most interesting growth. The new building will be of solid concrete, 300 by 200 feet, two stories, and will include 100,000 square feet of floor space. The cost of building alone was \$400,000. The new plant provides for doubling the output of 1920. Modern improvements for employees' welfare include shower-baths, grounds for athletic events, baseball, tennis, etc. There is a cafeteria where meals will be served at cost, club-rooms, a moving-picture booth for educational and entertaining purposes.

The business of the company is the manufacturing of ventilating apparatus, ILG self-cooled motor propeller fans and universal blowers and exhausters, unit heaters, and air washing units. The company derives its name from Mr. Robert A. Ilg, the inventor.

Concrete Construction

By DeWitt Clinton Pond, M.A.

SECOND ARTICLE

IN the last article there was a discussion of the stresses in a typical slab and beam in the floor panels outlined by columns 9, 12, 15, and 17 of the building now being erected for the 395 Hudson Street Corporation by the Turner Construction Company. This building is located at the corner of Hudson and West Houston Streets, in New York City, and occupies an entire city block.

The architects for this building are McKenzie, Voorhees & Gmelin, of New York.

In following through the calculations in this article it will be necessary to refer to the figures—I, II, III, and IV—in the last article, which appeared in the September number of ARCHITECTURE. In carrying on the calculations for

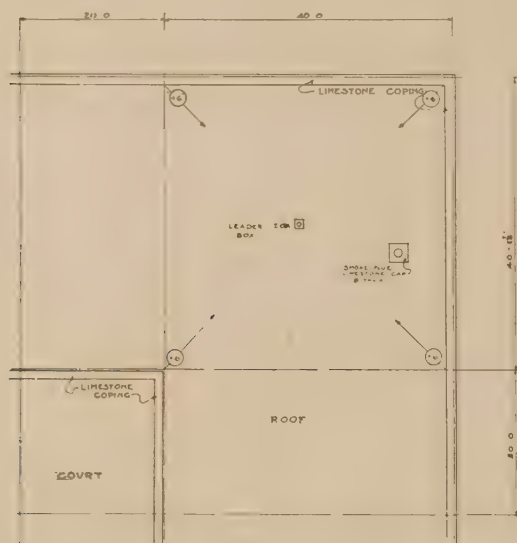


FIGURE V

the typical beam it will be necessary to design the stirrups. In the last article it was found that even if the width of the beam was increased to 1 foot and 2 inches the shear per square inch would be 150 pounds—the maximum allowed by the New York Building Code. Of this, in accordance with general practice but not the New York Building Code, 40 pounds will be taken up by the concrete and 110 pounds by the steel. The clear span of the beam is 17 feet 6 inches, and the proportionate length that will take the excess of shear over 40 pounds will be $110/150 \times 17.5 = 12.83$ feet, or 153.9 inches. The beam is 14 inches wide and the area over which the shear will be applied will be $153.9 \times 14 = 2,155$ square inches. The excess shear is 110 pounds, the average shear over this area is 55 pounds, and the total shear is $55 \times 2,155 = 118,525$ pounds. The value of a $\frac{3}{8}$ -inch stirrup (Fig. III, in the previous article) is 3,532 pounds, and the value of a $\frac{1}{2}$ -inch stirrup is 6,281 pounds.

Dividing 118,525 by 6,281 gives 19 stirrups. There will be two $1\frac{1}{2}$ square, double-bent bars, with a total cross-sectional area of 2.53 square inches, and as seven-tenths of this area may be used to withstand the horizontal shear, 1.77 square inches may be deducted from the area of the stirrups. $1.77 \div .3926 = 4.5$, approximately, as the number of stir-

rups that the bent-up steel would replace. The steel is bent up at both ends of the beam so it will take the place of 9 stirrups in the entire length. The total number of stirrups will be $19 - 9 = 10$ necessary in the beam. It will be noted by looking in the list, in Fig. III, that *B1* is reinforced in exact accordance with the figures given above, and that the dimensions, except the length, correspond to those already determined. The true length of the beams cannot be determined until the girders are designed.

These articles are intended for general practice and the new New York Building Code has not been strictly followed. In the actual construction heavier reinforcing has been used as far as stirrups are concerned, as the code requires a shearing stress in concrete of 150 pounds when *all* diagonal tension is resisted by the steel. In accordance with this law there will have to be twenty-six stirrups. The method used herewith has been found to give very good results, however, and unless a building law states otherwise its use is recommended.

As far as the slab is concerned, it will be noticed that the spacing of the $\frac{1}{2}$ -inch round bars was given as 7 inches in the previous article, and that the list shows these bars spaced $7\frac{3}{4}$ inches on centres. This is accounted for by a reconsideration of the figures given in the last article. In this calculation the span of the slab was taken as 4 feet. Actually, it has been pretty definitely established that this span will be only 3 feet 10 inches, and the spacing of the bars on this basis works out between $7\frac{1}{2}$ and $7\frac{3}{4}$ inches. The engineers evidently thought the last spacing gave enough reinforcing. They may not have taken the weight of wood block paving as high as has been the case in these calculations.

So far, in a tentative manner, a typical beam and slab have been designed, such as are marked *B1* and *S41*, in Fig. II. The slab can be considered as being definitely designed, but, owing to the variation in lengths of the beams, which vary on account of the difference of thickness of the girders, these beams cannot be considered as established.

It will be noticed that *S46*, having the same span and load as *S41*, is more heavily reinforced than the latter, and there might be questions asked as to why this is so. The answer is that *S46* is not a continuous slab but is "semi-continuous," and the formula in such a case is $M = \frac{1}{10} Wl$. In the present case, an experienced engineer would not bother to go through all the lengthy steps outlined in the last article but would combine them all in one calculation and use his slide rule. The formulas would be combined in the following manner:

$$\frac{1,085 \times 3.83 \times 51 \times 2}{10 \times 16,000 \times 7 \times .1963} = 1.93 \text{ bars in 12 inches.}$$

$$12 \div 1.93 = 6.2 \text{ inches on centres.}$$

The results given above will be found to check with the information given in the Slab Schedule, where the spacing is given as 6 inches on centres.

In developing the sizes of beams and slabs in the first-floor panel the author has attempted to show that while certain of the slabs in a floor panel can be designed before

the columns are designed, it will be impossible to design the beams and girders until this is done. It has been shown that the lengths of beams are determined by the design of the girders, and the latter cannot have proportions and reinforcing determined until the sizes of the columns onto which they frame have been established.

It will therefore be necessary to start at this point the design of the columns and footings. Fig. V shows the roof plan and Fig. VI the ninth floor plan of the section under discussion. It will be noticed that columns 61 and 70 do not continue through the ninth-floor, but stop at the ceiling of the eighth. Column 77 does not carry even as far as these two, but stops at the ceiling of the seventh floor.

The first column that will be considered will be column 9. In determining the loads that will come on this support a tentative framing plan must be considered, if not actually drawn out. As 59 does not continue through the ninth story there will be a 40-foot span which will have to be taken care of in some manner. Either beams, spanning this distance, must be parallel to one framing into columns 58 and 60, or they must be framed at right angles to this direction. For the present it will be assumed that the long 40-foot beams will be framed in the first direction. In this case the only floor load that will come to the column will be that of a floor area 5 feet wide and 20 feet long, containing 100 square feet. The live load for the roof is taken as 40 pounds, as required by the building code of New York. The dead load must be assumed for the present from a general study of the slab construction which experience has shown to be proper. Assuming that a 5-inch slab is to be used; that the cinder fill will be kept to a minimum owing to variations in the level of the roof construction; that the tar-and-gravel roof finish will be 1 inch thick, the following will be a fair estimate of the roof loads:

60	pounds for the 5-inch slab.
25	" " " average fill of 5 inches.
10	" " " tar-and-gravel finish.
—	
95	" " " total.

There will be beams and girders framing into other exterior columns, the loads of which will have to be distributed over the floor, and so an average load of 100 pounds per square foot, will be taken as the general roof load.

There are other loads that have to be determined as being carried by the column. One of these is the weight of the column itself. Exterior columns are often designed to fit the architectural requirements and are made larger than necessary in order to save brick in the curtain walls. In the present case the flat-slab construction in the lower floor design limits the thickness, or rather determines it. These exterior columns in this building are designed to have a dimension, parallel to the building line, of 3 feet 10 inches, and their thickness remains 1 foot 8 inches, unless the loads become so great that a greater area of column is required. On the ninth floor this width can be reduced to 1 foot 4 inches, as beam and girded construction is used to support the roof. These requirements determine the area of the column and the weights can be found. The cross-sectional area will be $3.83 \times 1.33 = 5.1$ square feet. The finished roof will be 18 feet 6 inches above the ninth floor and the cubic contents of the column section will be $5.1 \times 18.5 = 94.3$ cubic feet, and the weight will be determined by multiplying this by 144, which will give a result of 13,000 pounds.

Another load that must be found is the weight of the wall, and in this load will also be figured the weight of the spandrel beams. Fig. VII shows the cross-section through

the parapet wall. The sketch shows a brick arch over the windows of the ninth story, which will be self-supporting. All the brick above this arch will be carried on the spandrel beams, and another beam is shown to support the roof construction. These two beams are shown in place of one in order to have a low parapet wall and yet have the beam supporting the roof in such a position that its height may vary with the slope of the roof.

In order to determine the load on the column the engineer must separate the construction into its various elements. It must be remembered that the sketch shown in Fig. VII is the architect's drawing, which was made before the structural members were designed. The engineer is at liberty to vary this slightly as far as the structural members are concerned, provided he does not change in any degree the architectural treatment.

It will be noticed that there are three kinds of materials shown: concrete, brick, and limestone. The two concrete beams will be taken as 8 inches thick and each 2 feet 9 inches high. Each lineal foot of these beams will contain 3.64 cubic feet of concrete, and will weigh $3.64 \times 144 = 524$ pounds.

The brick will be divided into three sections. There is the 4-inch facing on the face of the spandrel beam, a section of wall 1 foot thick, which carries up to the under side of the limestone cornice, and a section between the cornice

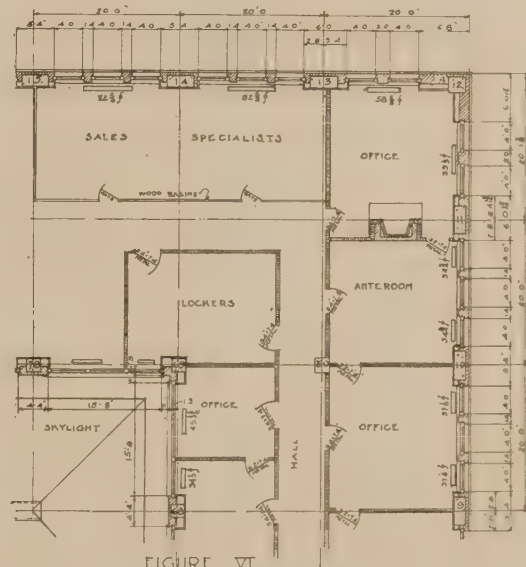


FIGURE VI

and coping, which is 1 foot 4 inches thick. The height of the brick facing is 2 feet 9 inches, the height from the spandrel beam to the cornice is 2 feet 4 inches, and the height of the brick in the parapet is 2 feet 6 inches. In order to determine the weight of this brickwork for each foot of wall the following calculations are necessary:

$$\begin{aligned}
 33 \times 2.75 &= .92 \text{ cubic feet of facing.} \\
 1.00 \times 2.33 &= 2.33 \text{ " " " wall.} \\
 1.33 \times 2.5 &= 3.33 \text{ " " " parapet wall.} \\
 &— \\
 &6.58 \text{ total.} \\
 6.58 \times 120 &= 790 \text{ pounds.}
 \end{aligned}$$

The weight of the limestone is not difficult to determine. Bulking the cornice and coping together, the stone

will be found to be 2 feet high and have an average thickness of 1 foot 6 inches, and each foot along the wall will contain 3 cubic feet. Limestone weighs 160 pounds per cubic foot, so each lineal foot will weigh $3 \times 160 = 480$ pounds. Adding the weights of all these three materials together the total weight of each foot of wall will be:

524	for concrete.
790	" brick.
480	" limestone.
1,794	" total.

The column will carry 20 feet of wall, so the total weight of wall will be $1,794 \times 20 = 36,880$ pounds.

The developing of a column schedule is one of the most exacting and perhaps one of the most tiresome tasks of an engineer. In order to do this, some system must be employed by which he can tabulate his loads and calculations. It will be noticed that there are many loads already determined

be reduced in accordance with the requirements of the code. Other columns should be used to list the additional loads, such as the weight of the structural column itself, the wall load, and any other information regarding weights that the designer may feel may not be listed under the other headings.

After all these loads are listed there should be other headings which give information regarding the column itself. This information should give the size of the column, the loads carried by the concrete and by the steel, the size of spiral wire used and its pitch, and the number and size of the vertical rods or bars. If such information is tabulated in some manner this can be given over to the draughtsman who is developing the column schedule and the results can be shown in such manner that the columns can be constructed on the job.

Owing to the need of explanation of each item in these articles, no attempt will be made to list the results of calculations as they are developed. It will be left to the reader to do this.

As far as the roof load on column 9 is concerned, the unit dead and live loads, the weight of the column, and the wall loads have been determined. It only remains to add these results together. The area carried by the column is 100 square feet. The unit dead load is 40 pounds and the total live load of the roof is 4,000 pounds. This, of course, cannot be reduced, as no reduction is possible according to the code until the load of the floor "next below the top floor" is figured.

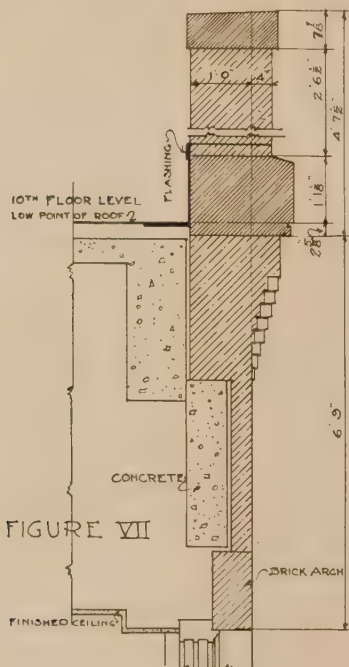
The dead load will be $100 \times 100 = 10,000$ pounds, and the column load has been determined as 13,000 pounds, and the wall load will be considered as 37,000 pounds. To this must be added the weight of the hung ceiling, which will be considered as 10 pounds per foot, having a total weight of 1,000 pounds. Adding these results, the total will be:

4,000	pounds live load.
10,000	" dead load.
13,000	" column load.
37,000	" wall load.
1,000	" hung-ceiling load.
65,000	" total.

This must be carried on an exterior column, rectangular in shape and reinforced by vertical steel and bands or ties. The concrete for this type of column is a 1, 2, 4 mixture, and 500 pounds per square inch is allowed on the concrete and 7,500 pounds on the steel. It will be remembered that because of architectural requirements this column was designed to contain 5.1 square feet in cross-section. It will be seen that this area is much more than necessary. One-half of one per cent of this area must be of steel, or 3.7 square inches. If it is considered that 7,000 pounds is allowed on the *net* area of the steel and 500 pounds allowed on the gross area of the concrete, the column will support 394,900 pounds, which is much in excess of the load upon it. It is unfortunate that the code requires that the steel should have as large an area as that given above, when a rectangular column is necessary. Unless a special ruling is made, however, the amount stated above is required. This can be made up of eight $\frac{3}{4}$ -inch round bars. The ties will be spaced 11½ inches on centres.

In the next article the design of other sections of the columns will be carried through, as well as the design of the other columns in the panel.

(To be continued)



for only one section of column. As these loads must be found for each floor, it can be seen that some form of tabulation is necessary. Every engineer who has a great deal of concrete to design has a printed form made out in which the various results of his calculations can be listed.

If the reader does not have one of these forms the following method of tabulating can be used: A form should be devised with lines ruled horizontally and vertically. The horizontal lines will represent the various floors, and the vertically ruled spaces will have various headings. The first heading will show the area of floor carried by the column, and the second and third will give the dead and live loads per square foot used in the calculations. The next two columns will give the total dead and live loads on the area carried by the column. It is important that these two types of loads should be kept separate, as the live load can

Book Review

ENGLISH HOMES, PERIOD IV. Vol. I: LATE STUART, 1649-1714. By H. AVRAY TOPPING, M.A., F.S.A. Profusely Illustrated from Photographs of Famous English Homes, Showing General Elevations, Exterior and Interior Details, Gateways, Gardens, Furniture, Iron Work, Plaster, etc., etc. Charles Scribner's Sons, New York.

This volume, one of the comprehensive and invaluable series that will include all the important periods from Norman and Plantagenet to late Georgian, is the first to be issued since the war. The earlier volumes of the series were entirely exhausted, and the new volumes will include revision and extension of the whole scheme, with a great mass of new material heretofore unpublished. The plan involves presentation of practically all the houses of England of real architectural merit, and will form a complete and monumental history of English domestic architecture.

In the volume under consideration are shown houses that were built under the direction or inspiration of the two greatest English architects, Inigo Jones and Sir Christopher Wren. The impression that these English houses give at first glance is one of stately dignity and reserve, not to say plainness, in keeping with the contemporary English mode of life.

The dawn of the Renaissance in England under Jones, and its apogee under Wren, is one of the most interesting of all the periods of development of English architecture, and the influence of their work has been a vital one ever since. If the exteriors of these houses were marked by re-



Errdig Park, Derbyshire.



Tijnun's stairway, Chatsworth, Derbyshire.

serve and general quiet homeliness in keeping with their natural environment, there was no lack of sumptuousness and luxury in their interiors. Many of them, once you enter the doors, come under the designation of palatial. The period was one when the wood-carver was at his best, when Grinling Gibbons was the great master designer in this field, and elaborately carved and decorated mantels were to be found in almost every house of note. The use of wood was made an art, and used in the panelling of the walls with a richness and elaborateness never surpassed. It is to Webb that the author credits the pre-eminence of the wood-work of this period.

The houses in this volume include some of the great ducal palaces as well as the more or less modest country squires' homes, and the text gives not only the particular reasons for the outstanding architectural character of each house but as well a history of its occupants. It is, therefore, a record of human affairs as well as a history of architectural structures. The individuality and personal tastes of the owners are brought out, and the part they played in the life of the nation.

In considering the influence of Inigo Jones it is to be noted that, although he was a keen follower of the Palladian tradition, with an exceptional first-hand knowledge by many visits to Italy of Italian architecture, both ancient and modern, he was never a mere copyist, but brought a fine artistic sense and originality to his work, a taste and a regard for fitness without which all architecture is but a mechanic art.

"The restraint, amounting often to severity, shown by Inigo Jones and his immediate followers in the matter of detail and ornament is a mark of the master's strong individualism. He formed and developed his style on his return from Italy in 1614. In 1628 Webb came to him and derived from this association the whole of his architectural taste and knowledge, subject only to English tradition, strong in him who had never left its shores. In 1647 Roger Pratt came home after long study in Rome. These are the only three names that survive in the history of our country-house architecture during the middle years of the seventeenth century when it first developed the Late Renaissance phase. They are its founders and earliest practitioners. Two of them learned it in Italy itself, the third at home by close connection with the elder and greater of the other two. From Italy, therefore, it came, and yet it is not what Jones and Pratt found fashionable in Italy when they visited it, for there the baroque style had ousted restraint and the word *pittresco* was on men's lips. After a youth of extreme virility the architecture of the Italian Renaissance had reached manhood at the beginning of the sixteenth century under such men as Bramante and San Gallo. In the third generation came Palladio who, like several of his predecessors, wrote on the principles as well as practised the art of the reborn style. To them Vitruvius, whose treatise on Augustan architecture survived, was as a little god."

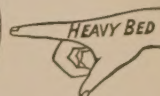
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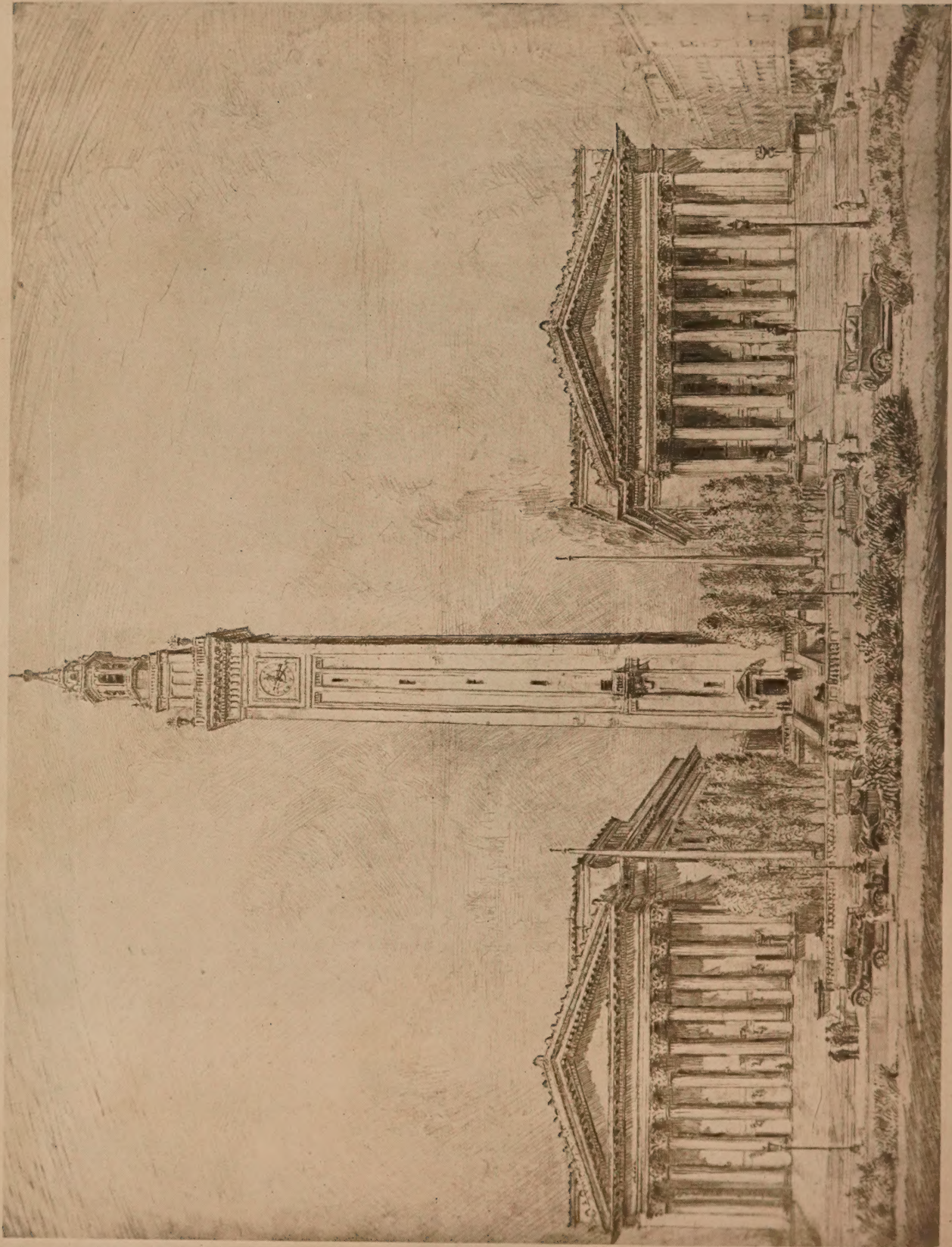
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